

APPENDIX F LANDSCAPE CHARACTER AND VISUAL ASSESSMENT REPORT



LANDSCAPE AND VISUAL IMPACT ASSESSMENT

Stubbo Solar Farm





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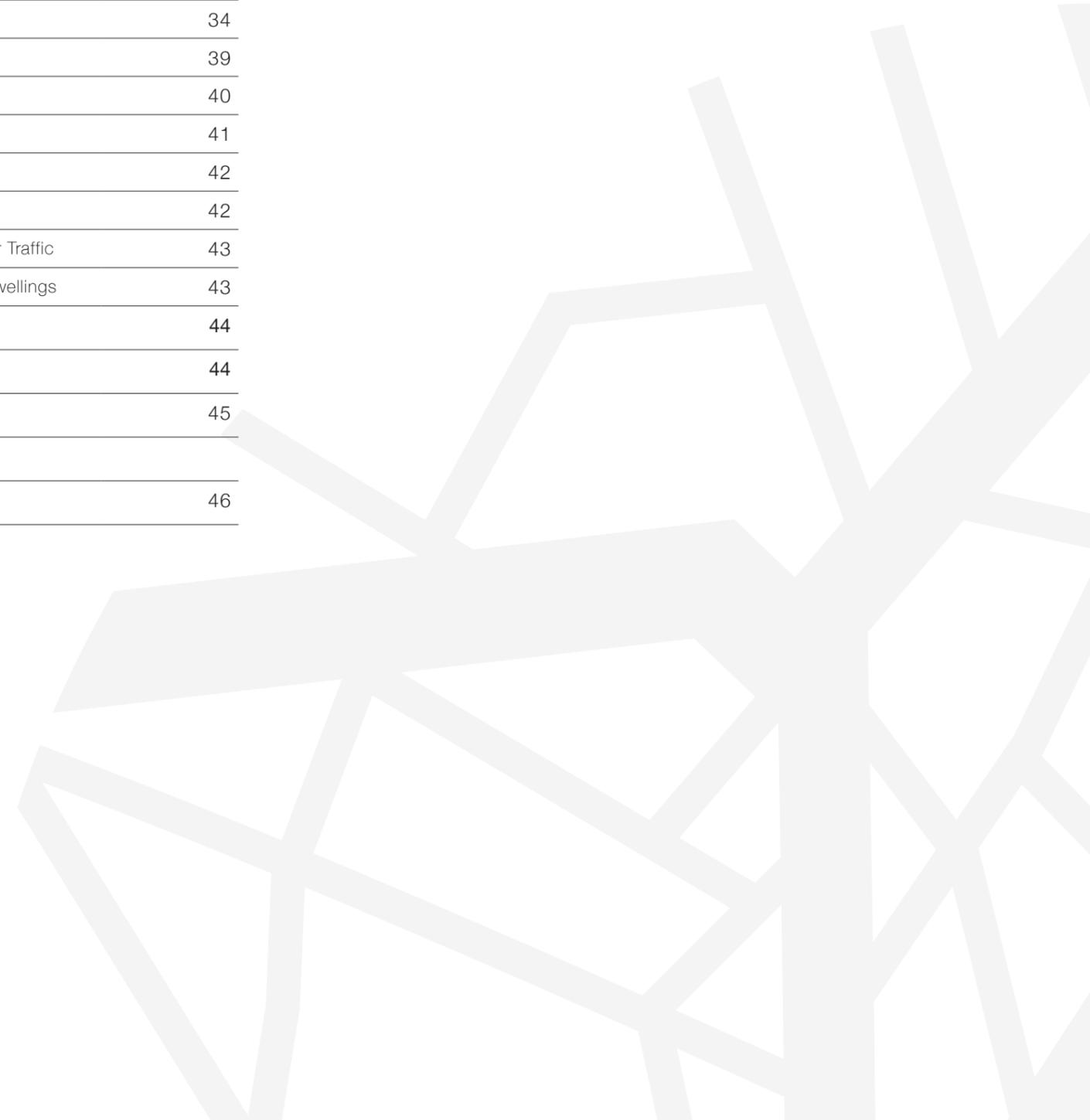
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1.0 Introduction

1.1 Background

Moir Landscape Architecture have been commissioned by UPC\AC Renewables Pty Ltd to prepare a Landscape and Visual Impact Assessment (LVIA) for the proposed Stubbo Solar Farm. UPC\AC Renewables Pty Ltd (UPC) proposes to develop the Stubbo Solar Farm, a grid-connected photovoltaic (PV) solar farm of up to 400 megawatts in the New South Wales Central West Orana region (the project). The project would be located approximately 90 kilometres east of Dubbo, in the Mid-Western Regional Council Local Government Area. The regional context of the project is presented in **Figure 1**.

This report details the results of the field work, documents the assessment of the landscape character and visual setting, and assesses potential visual impacts associated with the proposal. Survey work was undertaken during September 2020 using key viewpoints and locations with potential views towards the Site.

The report also provides an overview of the proposed treatments which may be considered to assist in the mitigation of potential visual impacts. This information is provided to aid understanding of the likely impacts and how they may be managed to ensure that the positive character of the immediate area and surrounding visual landscape are not overly modified or diminished.

1.2 Project Requirements

The purpose of this report is to provide a qualitative and quantitative assessment of the visibility and potential visual impacts of the Project. The capital value of the project would be in excess of \$30 million. Accordingly, the project is a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SEPP SR&D) and Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The LVIA will support the Environmental Impact Statement (EIS) for the Project and has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning, Industry and Environment (DPIE) which includes:

'An assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, Siding Spring Observatory in accordance with the Dark Sky Planning Guideline, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners;'

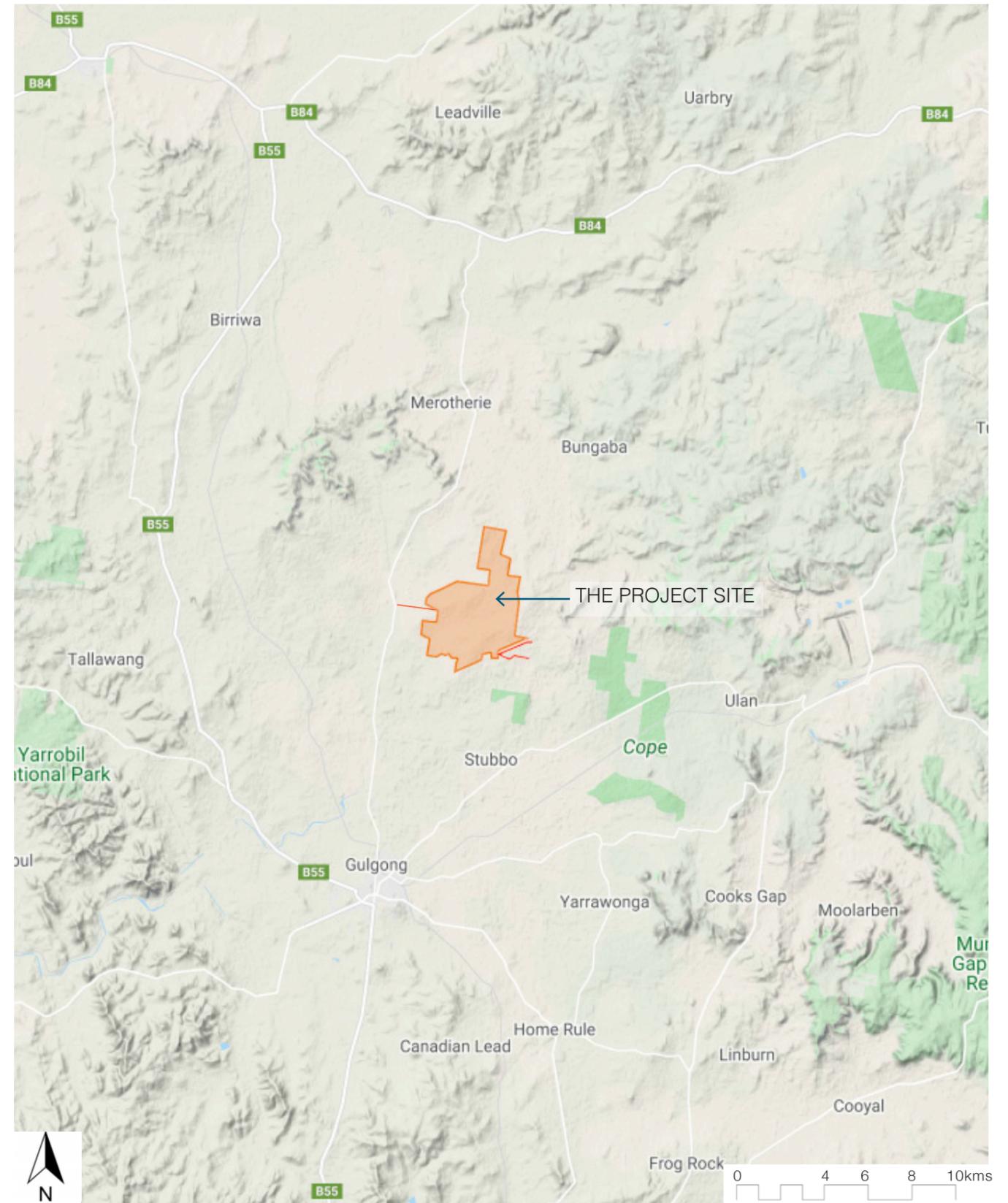


Figure 1: Site Context Plan (Image source: Google Maps)

1.0 Introduction

1.3 Report Structure

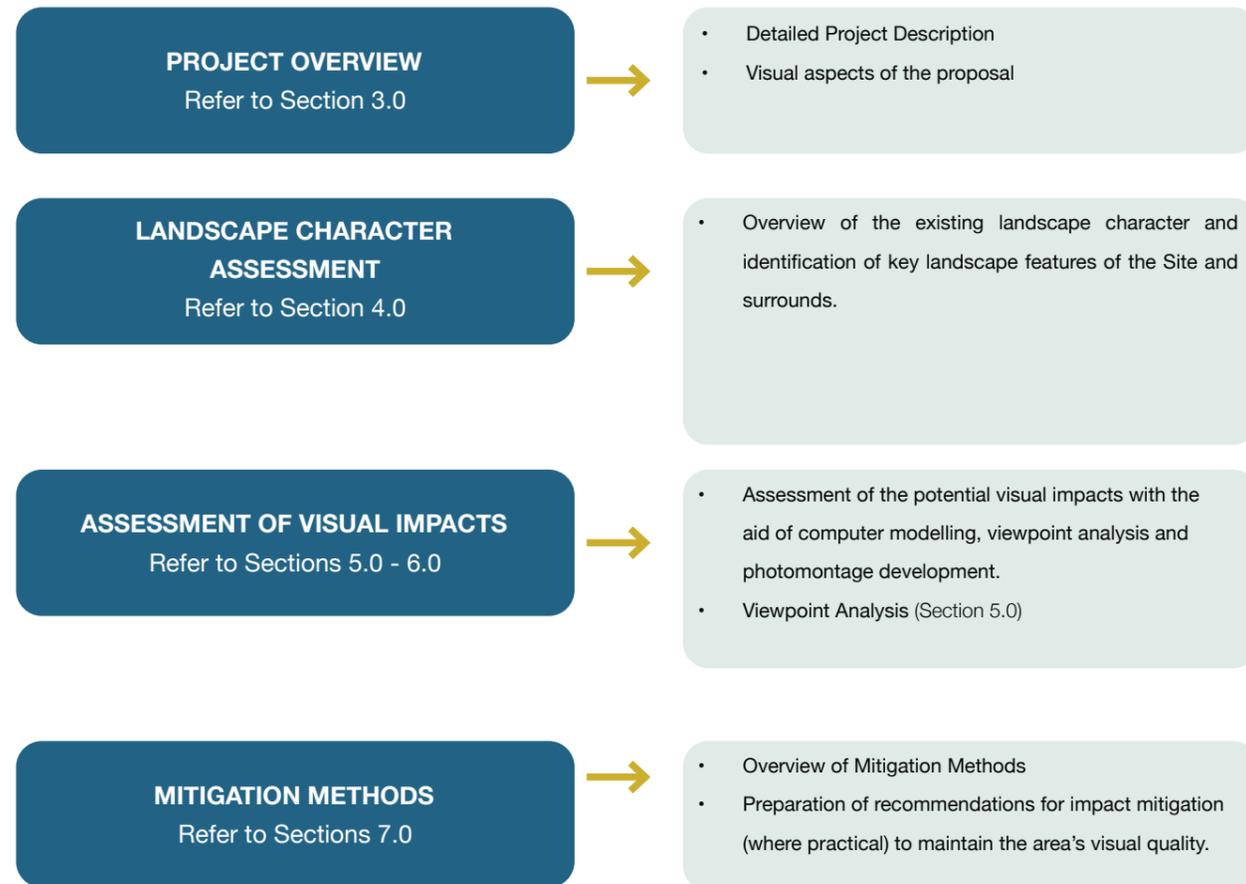
The following table provides an outline of the report structure, a brief overview of the objectives of the SEARs (shown in italics) and a summary of how these have been addressed in the LVIA. Detailed methodologies for each part of the assessment have been included in the relevant chapters of the report.

Landscape and Visual Impact Assessment Report Structure	
Section 2.0: Study Method	Overview of Study Method utilised for the LVIA.
Section 3.0: Project Overview	Project Description and overview of associated infrastructure to be assessed within the LVIA.
Section 4.0: Existing Landscape Character	Establish the existing landscape and visual conditions prior to undertaking any visual assessment.
Section 5.0: Zone of Visual Influence	Establish the zone of theoretical visibility (the area from which the proposal is theoretically visible based on topography alone).
Section 6.0: Viewpoint Analysis	Assessment of key viewpoints within the visual catchment.
Section 7.0: Photomontages	Preparation of photomontages to illustrate the appearance of the proposal.
Section 8.0: Visual Impact Assessment	Overview of the visual impacts resulting from the project. - Public Land - Dwellings - Cumulative Visual Impacts - Associated infrastructure - Night lighting <i>Assessment of the likely visual impacts of the development on surrounding residences, scenic or significant vistas on Siding Spring Observatory in accordance with the Dark Sky Planning Guideline</i>
Section 9.0: Reflectivity and Glare	Assessment of the potential reflectivity and glare. <i>Assessment of likely visual impacts of the development (including any glare, reflectivity and night lighting) on air traffic and road corridors in the public domain.</i>
Section 10.0: Mitigation Recommendations	An outline of proposed mitigation and management options. <i>Include a draft landscape plan for on-site perimeter planting, with evidence it has been developed in consultation with affected lanowners.</i>
Section 11.0: Conclusion	

2.0 Study Method

2.1 Overview of the Study Method

Based on the existing policies and framework and experience in large scale landscape and visual impact assessment, the following provides an overview of the study method utilised for undertaking the Landscape and Visual Impact Assessment (LVIA). The LVIA was undertaken in the stages as noted below:



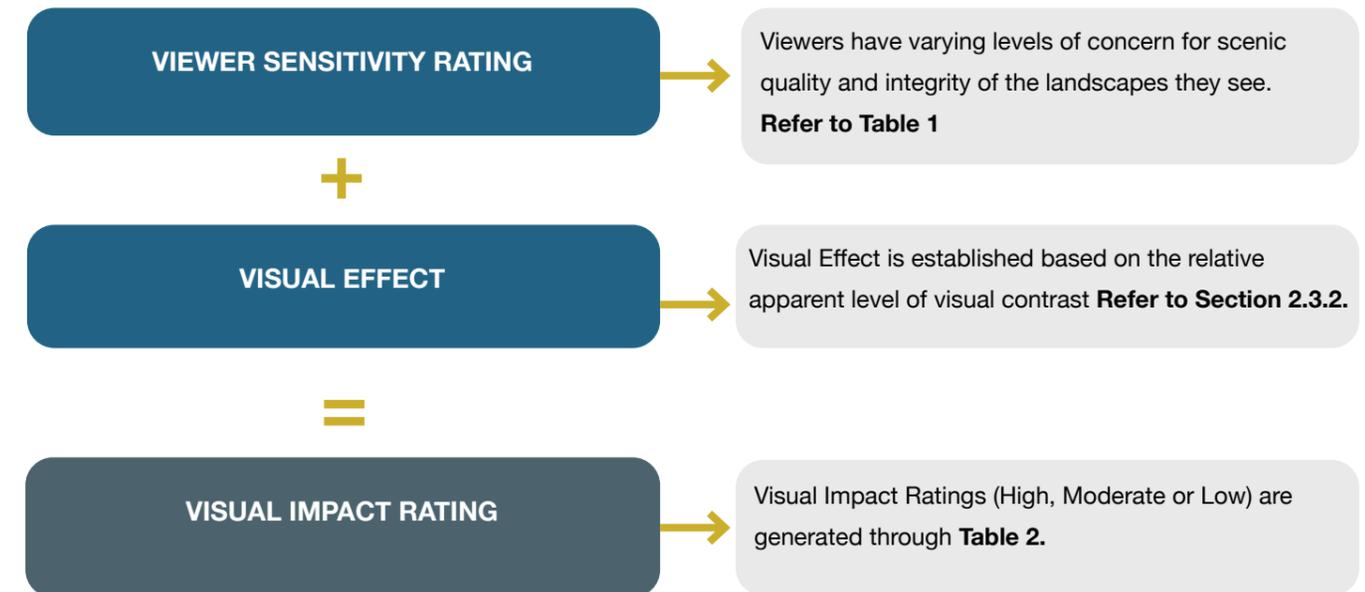
2.2 Landscape Character Assessment

The landscape character of a site refers to the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects how particular combinations of geology, landform, soils, vegetation, land use and human settlement create a particular sense of place for different areas within the landscape (The Landscape Institute and the Institute of Environmental Management and Assessment, 2002).

The landscape character of the site has been assessed at a regional, local and site scale. The Landscape Character Assessment is provided in **Section 4.0**.

2.3 Visual Impact Assessment

The potential visual impact of the proposal is then assessed based on the relationship between the visual sensitivity (refer to **Section 2.4.1**) and visual effect (refer to **Section 2.4.2**).



2.0 Study Method

2.3.1 Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the proposal (EDAW, 2000).

For example, a significant change that is not frequently seen may result in a low visual sensitivity although its impact on a landscape may be high. Generally the following principles apply:

- Visual sensitivity decreases as the viewing time decreases.
- Visual sensitivity decreases as the number of potential viewers decreases.
- Visual sensitivity can also be related to viewer activity (e.g. A person viewing an affected site whilst engaged in recreational activities will be more strongly affected by change than someone passing a scene in a car travelling to a desired destination).

Sensitivity ratings are defined as high, moderate or low and are shown in the **Table 1** below (adapted from URBIS, 2009).

VISUAL SENSITIVITY RATING					
	DISTANCE FROM SITE				
LANDUSE	0-1 km	1-2 km	2 - 4.5 km	4.5 -7 km	> 7 km
Townships	HIGH	HIGH	HIGH	MODERATE	LOW
Recreational Reserve	HIGH	HIGH	HIGH	MODERATE	LOW
Homestead	HIGH	HIGH	HIGH	MODERATE	LOW
Rural Township	HIGH	HIGH	MOD	LOW	NIL
Main Highway	MOD	MOD	LOW	LOW	NIL - LOW
Local Roads	MOD	MOD	LOW	LOW	NIL - LOW
Farm Road	LOW	LOW	NIL - LOW	NIL - LOW	NIL
Agricultural Land	LOW	LOW	NIL - LOW	NIL - LOW	NIL

Table 1: Visual Sensitivity Rating Table (Adapted from Urbis, 2009)

2.3.2 Visual Effect

Visual effect is defined as the interaction between a proposal and the existing visual environment. It is often expressed as the level of visual contrast of the proposal against its setting or background in which it is viewed.

Low level: occurs when a proposal blends in with its existing viewed landscape due to a high level of integration of one or several of the following: form, shape, pattern, line, texture or colour. It can also result from the use of effective screening ie. Topography and vegetation.

Moderate level: occurs where a proposal is visible and contrasts with its viewed landscape however, there has been some degree of integration (e.g. Good siting principles employed, retention of significant existing vegetation, provision of screen landscaping, appropriate colour selection and/or suitably scaled development).

High level: results when a proposal has a high visual contrast to the surrounding landscape with little or no natural screening or integration created by vegetation or topography.

2.3.3 Visual Impact

Visual impact refers to the change in appearance of the landscape as a result of development. (EPHC, 2010). Visual impact is the combined effect of visual sensitivity and visual effect. Various combinations of visual sensitivity and visual effect will result in high, moderate and low overall visual impacts as suggested in **Table 2** below (URBIS, 2009).

VISUAL IMPACT RATING				
		VISUAL EFFECT		
		HIGH	MODERATE	LOW
VISUAL SENSITIVITY	HIGH	HIGH IMPACT	HIGH IMPACT	MODERATE IMPACT
	MODERATE	HIGH IMPACT	MODERATE IMPACT	LOW IMPACT
	LOW	MODERATE IMPACT	LOW IMPACT	LOW IMPACT

Table 2: Visual Impact Rating Table (Adapted from Urbis, 2009)

2.0 Study Method

2.4 Guidelines and Statutory Framework

In addition to the SEARs, the following provides an overview of the guidelines, relevant frameworks and considerations of authorities utilised to form the methodology for this visual impact assessment.

2.4.1 Large-scale Solar Energy Guideline

This guideline provides the community, industry, applicants and regulators with general guidance on the planning framework for the assessment and determination of State significant large-scale solar energy projects under the Environmental Planning and Assessment Act 1979 (EP&A Act). The key assessment issues identified in the Guideline addressed in this Landscape and Visual Impact Assessment include:

- **Visual impacts:** *The impacts on landscape character and values and the visual amenity of landholders and communities.* The impacts on landscape character and visual amenity has been addressed in **Section 8.0** of this LVIA.
- **Cumulative impacts:** *Any cumulative impacts from any other developments (proposed, approved and operating), especially biodiversity, visual impacts, socio-economic and construction traffic impacts. For example, multiple solar developments in close proximity to each other may have a cumulative impact on other rural industries or adjacent land uses, amenity, biodiversity, visual effects or scenic landscapes.* An overview of the potential cumulative visual impacts has been addressed in **Section 8.4** of this LVIA.

2.4.2 Mid-western Regional Council

The project site is located within the Mid-Western Regional Council LGA. The Site is zoned RU1 Primary Production under the *Mid-Western Regional Local Environmental Plan 2012*. The project is broadly consistent with the objectives of the RU1 zone.

The objectives of RU1 Primary Production are as follows:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To maintain the visual amenity and landscape quality of Mid-Western Regional by preserving the area's open rural landscapes and environmental and cultural heritage values.
- To promote the unique rural character of Mid-Western Regional and facilitate a variety of tourist land uses.

The significant approach to Mudgee has been mapped in Section 6.10 of the LEP as *Visually Sensitive Land near Mudgee*. The objective of this clause is to protect the visually and environmentally significant land on the urban fringe of the town of Mudgee. The Site is in excess of 30 kilometres north of Mudgee and will not impact the visually sensitive land.

2.4.3 Dark Sky Planning Guideline

The Dark Sky Planning Guideline (2016) is a matter for consideration for all development under the Environmental Planning & Assessment Act 1979 (the Act) before development consent is granted within the local government areas of Coonamble, Dubbo, Gilgandra and Warrumbungle. The Project falls within the Dark Sky Region which consists of the land within a 200 kilometre radius of Siding Spring Observatory. An assessment of night lighting in regards to the Dark Sky Planning Guidelines associated with the Project has been included in **Section 7.0** of this LVIA.

3.0 Project Overview

3.1 Project Overview

The project would include the construction, operation and decommissioning of a 400-megawatt solar farm that would supply electricity to the National Electricity Market.

Key infrastructure for the project would include:

- single axis tracking photovoltaic modules (solar panels) across the development footprint
- power conversion units (PCUs)
- onsite substation containing two main transformers and associated switchgear
- transmission infrastructure, including:
 - up to 33-kilovolt overhead and/or underground electrical reticulation connecting the power generating infrastructure to the onsite substation
 - onsite connection from the substation to the existing 330-kilovolt transmission line (Line 79) operated by TransGrid
- a battery energy storage system (BESS)
- operational and maintenance ancillary infrastructure including:
 - staff office, meeting facilities and amenities
 - car parking
 - a temperature-controlled spare parts storage facility
 - supervisory control and data acquisition (SCADA) facilities
 - a workshop and associated infrastructure
 - permanent security fencing
- access roads, both to the project and internal access roads
- temporary facilities required during the construction and decommissioning phases, such as:
 - construction compounds and laydown areas suitable for plant and equipment
 - site office and amenities
 - parking areas
 - containers for storage
 - access tracks and associated infrastructure, including gates and fencing.

The permanent and temporary components associated with construction and operation would be located within the development footprint for the project, which would cover an area of approximately 1243.3 hectares. A designated environmental exclusion zone (EEZ) would be included within the development footprint, intended to minimise impacts of the development in the areas of highest environmental value. An indicative project layout is provided in **Figure 2**.

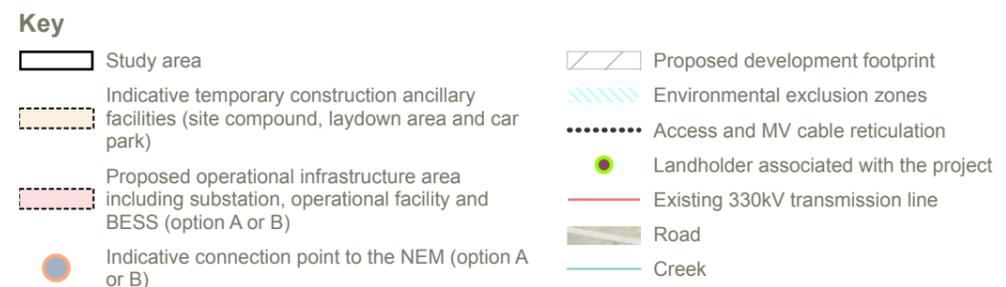
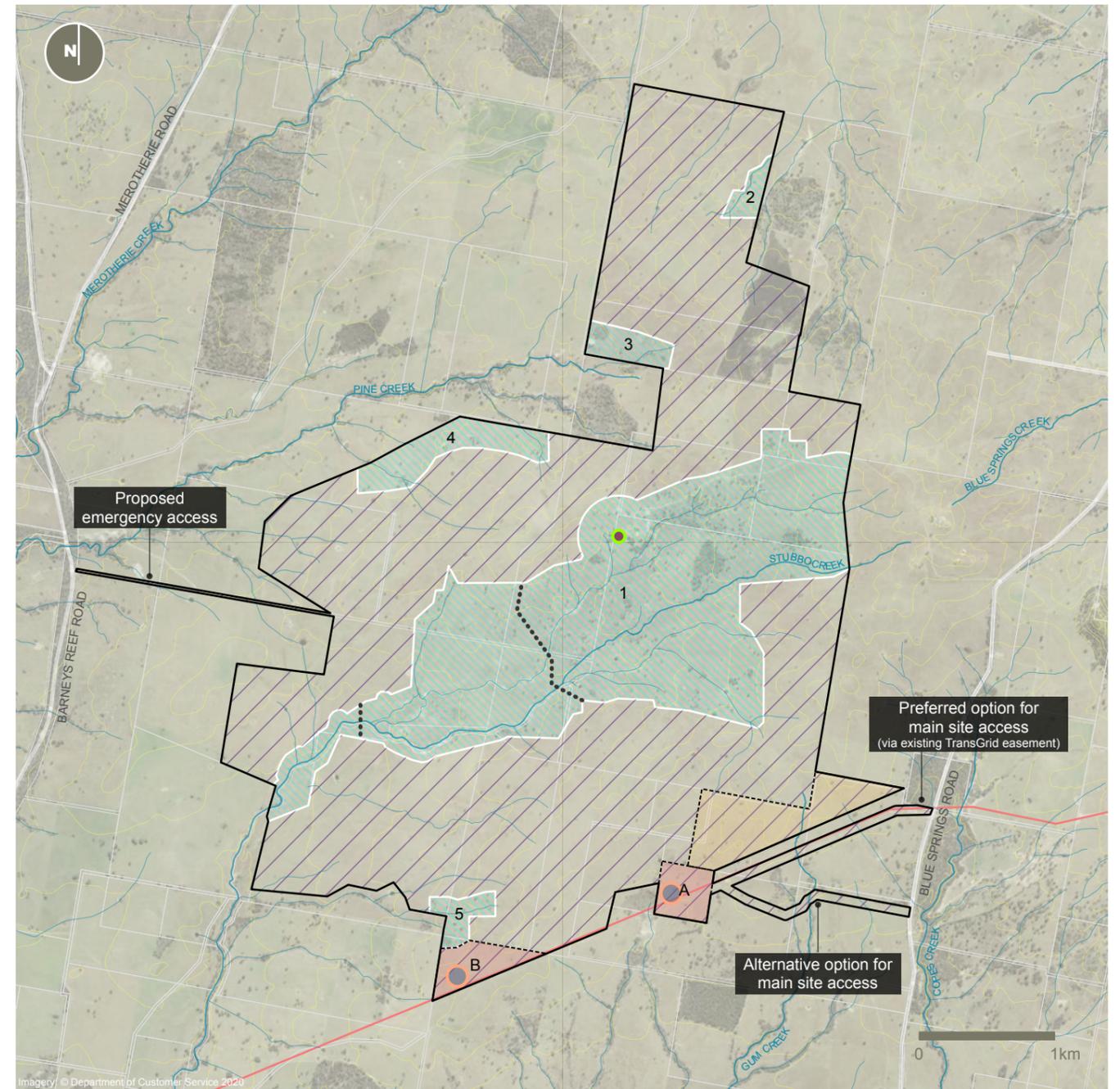


Figure 2: The Proposal (Source: UPC/AC Renewables)

3.0 Project Overview



Image 01.

Example of Solar Panel

(Source Moir LA, Manildra Solar Farm)



Image 02.

Example birds eye view of Solar Farm array

(Source Moir LA, Manildra Solar Farm)



Image 03.

Example of a Power Conversion Unit

(Source Moir LA, Manildra Solar Farm)



Image 04.

Example of an Operations Facility

(Source Moir LA, Manildra Solar Farm)

4.0 Existing Landscape Character

4.1 Site Description

The Proposed Development Site (referred to hereafter as the Site) is located between Blue Springs Road and Barneys Reef Road to the north of Stubbo.

The Site is zoned RU1 Primary Production under the *Mid-Western Regional Local Environmental Plan 2012*. Much of the Site is cleared of vegetation and utilised for grazing and modified pasture. Some limited scattered vegetation exists within the Site. Existing 330kV and 132kV transmission lines and towers run parallel to the southern boundary of the Site.

The study area is located within a relatively isolated area of land which is sparsely populated. Seven (7) non-involved dwellings are located within 2000 metres of the site boundary as shown on **Figure 3**.

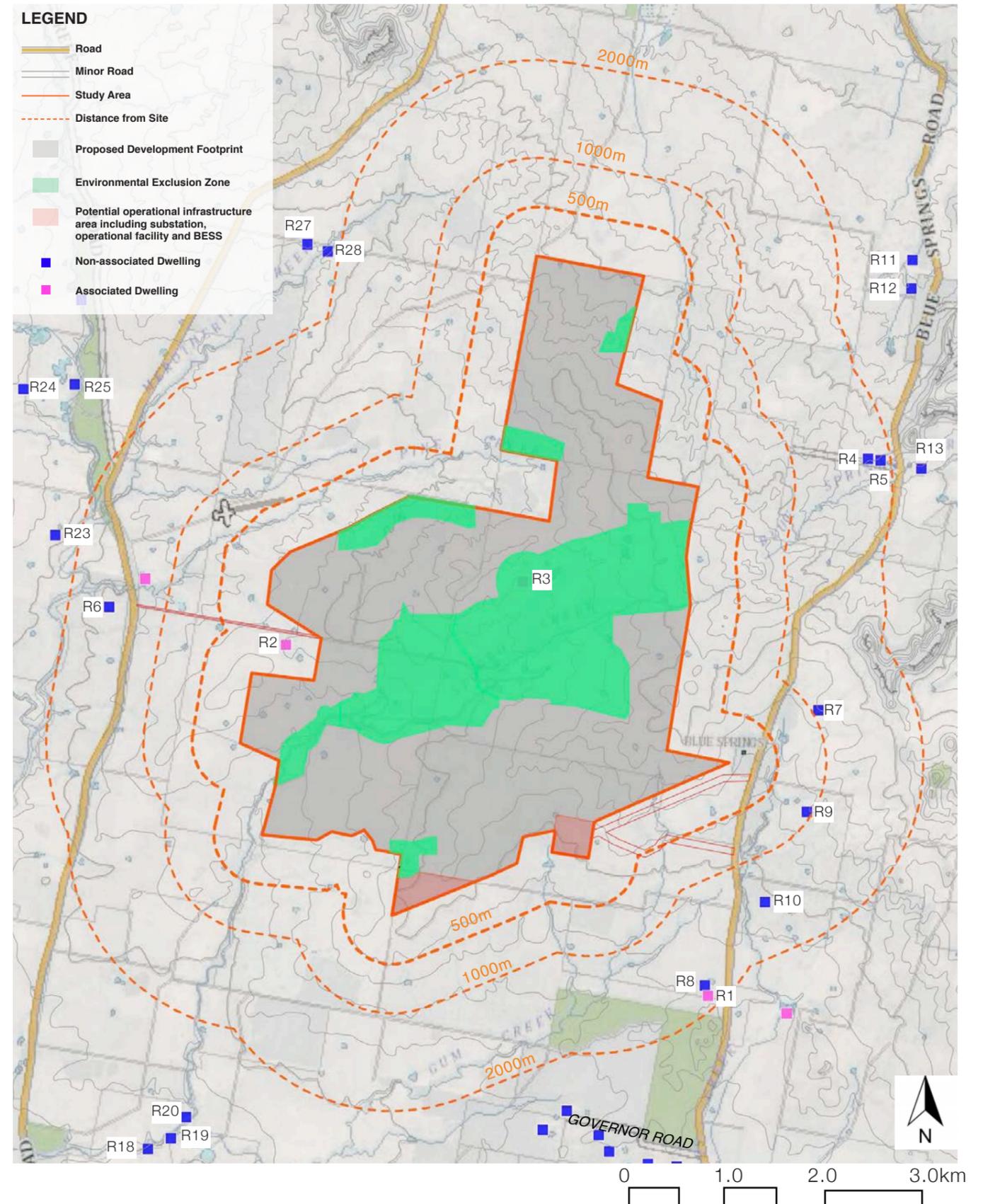


Figure 3: The Proposed Development Site (Map Source: Six Maps 2020)

4.0 Existing Landscape Character

4.2 Existing Landscape Character

4.2.1 Land Use

The Study Area is predominately characterised by grazing and modified pasture with some small pockets of dryland cropping.

4.2.2 Roads

Roads in the area immediately surrounding the Site are limited to minor roads which are generally utilised for access to isolated homesteads. The nearest main road is Cope Road which is located approximately 5 kilometres south of the Study Area connecting Gulgong and Ulan. Blue Springs Road runs in a generally north direction from Cope Road to the east of the Site connecting to Birkalla Road to the north. Current access to the eastern side of the Site is via Blue Springs Road. Barneys Reef Road runs from Gulgong in a north direction to the west of the Site. Barneys Reef Road diverges to the west of the Site and Merotherie Road continues to the north west of the Site and onto the Golden Highway. Access to the Site from the west is via Barneys Reef Road. Roads within the area are typically characterised by dense roadside vegetation which contains views (see **Image 6**).

4.2.3 Towns

The Site is located approximately 10 kilometres NNE of Gulgong. The population of Gulgong is 2,521. The Site is located within the suburb of Stubbo, a rural area defined by large lot rural residential properties to the south of the Site. In the 2016 Census, there were 232 people in Stubbo (ABS, 2016).

4.2.4 Infrastructure

Existing 330kV and 132kV transmission lines and associated towers run in a generally south west direction from Blue Springs Road to Barneys Reef Road along the southern boundary of the Project Site.

4.2.5 Vegetation

Land has been extensively cleared with the exception of scattered vegetation associated with the Stubbo Creek and its tributaries which run through the centre of the Site. Remnant vegetation within the area is typically Blakely's red gum-narrow-leaved red ironbark woodland community

4.2.6 Topography

Land in the Study Area consists of undulating hills and low hills with granite outcropping as tors and sloping pavements.



Image 05. Existing transmission lines and towers



Image 06. Roadside vegetation on Barneys Reef Road - typical of the area



Image 07. Typical character of the Study Area

5.0 Zone of Visual Influence

5.1 Overview of Zone of Visual Influence

An initial visibility assessment was undertaken utilising Zone of Visual Influence mapping. This tool helped to define the theoretical areas from which the proposed solar farm would be visible and create the 'Visual Catchment'.

The Zone of Visual Influence (ZVI) represents the area over which a development can theoretically be seen, and is based on a Digital Terrain Model (DTM). The ZVI is a desktop tool intended to make the fieldwork more efficient by clearly excluding areas that are screened by topography. Considerable field assessment is then undertaken predominantly within the areas where potential for impact exists.

The ZVI usually presents a bare ground scenario - ie. A landscape without screening, structures or vegetation, and is usually presented on a base map. It is also referred to as a zone of theoretical visibility (The Landscape Institute and the institute of Environmental Management and Assessment, 2002). As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing the worst case scenario. In reality the zone of visibility of the Stubbo Solar Farm is far less than that shown in the following ZVI Map (Refer to **Figure 4**).

5.2 Summary of Zone of Visual Influence

The ZVI was prepared based on the development footprint of the Project at an assumed height of 4.3 metres to represent the worst case scenario. The ZVI identified large areas of land surrounding the Site to the east and north from which topography will screen views to the Project. The figure illustrates topography will screen views from four (4) non-associated dwellings within 2000m of the Project Site (R4, R5, R6 & R7). The remaining three (3) non-associated dwellings (R7, R8 & R9) identified a small portion (between 1-25%) of potential visibility towards the Project (based on topography alone). Detailed assessment identified intervening vegetation would likely screen views from these dwellings (refer to Section 8.0).

There are no areas with opportunities to view the Project in its entirety. A number of dwellings identified in excess of 2000 metres will also be screened by topography, with some showing potential to view between 1-25% of the Project. Three dwellings were identified as having the potential to view 25 - 50% of the Project. Detailed assessment identified intervening vegetation would reduce or completely screen any potential views (see Section 8.0) from the majority of dwellings outside of 2000m of the Project Site.

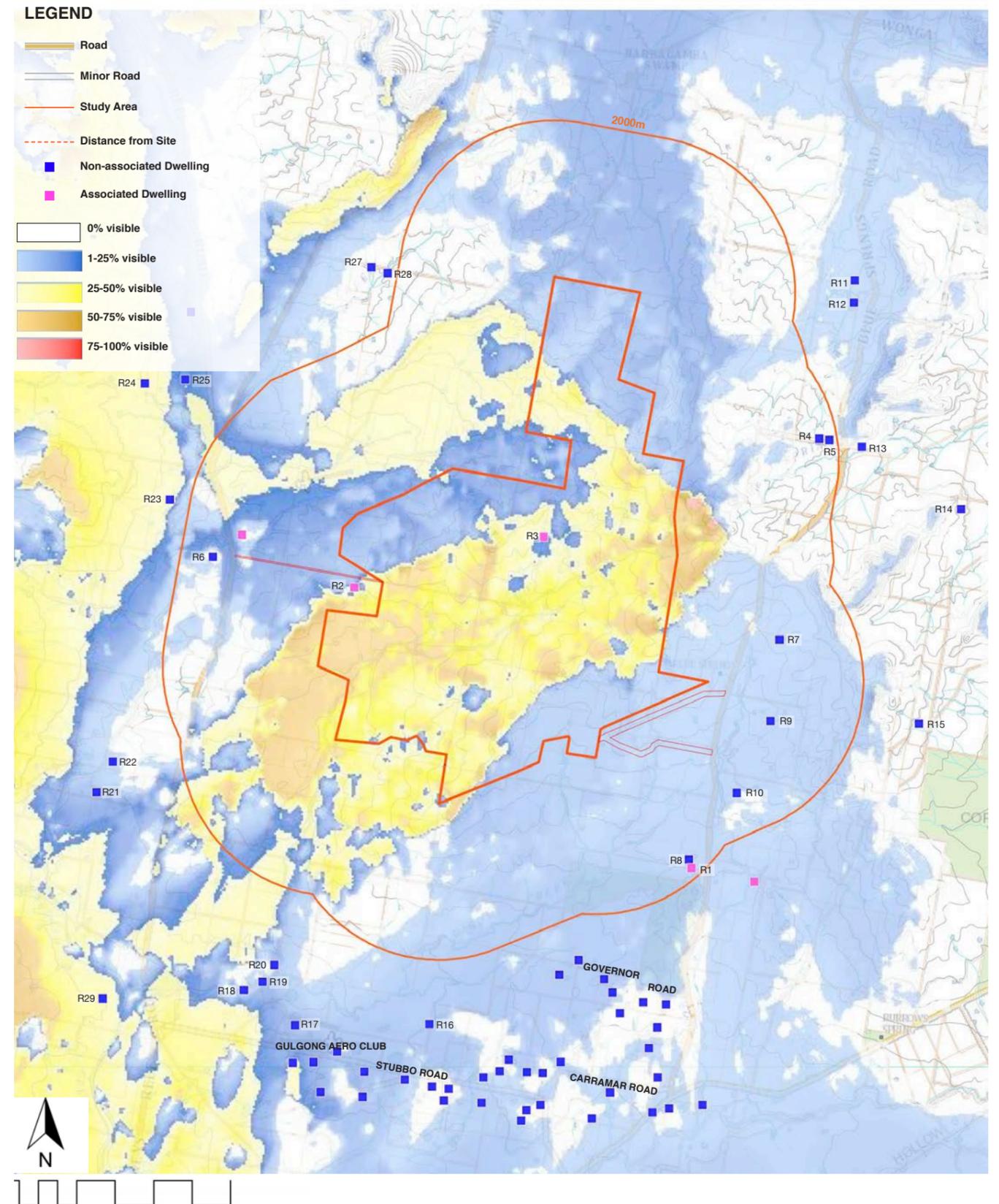


Figure 4: Zone of Visual Influence (Map Source: Six Maps)

6.0 Viewpoint Analysis

6.1 Viewpoint Analysis Methodology

The viewpoint analysis visual assessment report considers the likely impact that development would have on the existing landscape character and visual amenity by selecting prominent sites, otherwise referred to as viewpoints.

Once the viewpoint had been selected, panoramic photographs were taken on a level tripod at a height of 150cm (to represent eye level). Photographs were taken with a Canon EOS 5D Mark IV Full Frame digital SLR through a 50mm fixed focal lens which closely represents the central field of vision of the human eye.

The visual impact of the viewpoint was then assessed both on site and with the topographic and aerial information to ensure accuracy. For each viewpoint, the potential visual impact was analysed through the use of a combination of the 3D terrain modelling, topographic maps and on site analysis. Viewpoint photographs and analysis is included in the following pages. The findings of the viewpoint analysis have been quantified and are summarised in **Table 3**.

6.2 Viewpoint Selection Process

A total of **16 viewpoints** were recorded as part of the field work process. The locations of the viewpoints have been identified in **Figure 5** and the general viewing direction of each viewpoint is identified on each viewpoint. Viewpoints have been carefully selected to be representative of the range of views within the study area. The selection of viewpoints is informed by topographical maps, field work observations and other relevant influences such as access, landscape character and the popularity of vantage points.

Viewpoints are selected to illustrate a combination of the following:

- Areas of high landscape or scenic value.
- Visual composition (eg. focused or panoramic views, simple or complex landscape pattern).
- Range of distances.
- Varying aspects.
- Various elevations.
- Various extent of development visibility (full and partial visibility)
- Views from major routes.

It is important to note that all viewpoints for this study have been taken from accessible public land (typically gates, walking tracks, roads, recreation reserves and lookouts) which were identified as having a potentially high visual impact through the desktop review process.

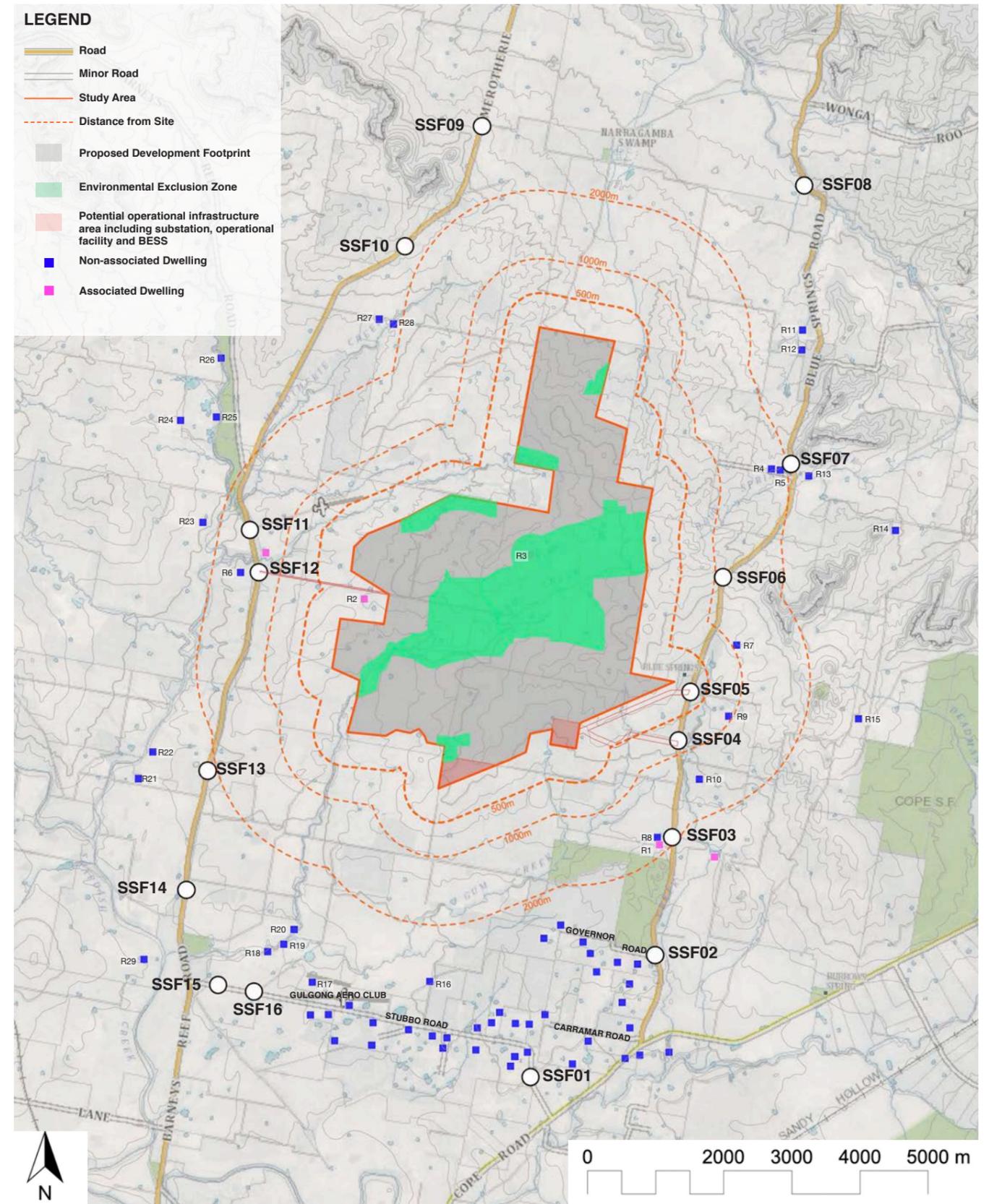
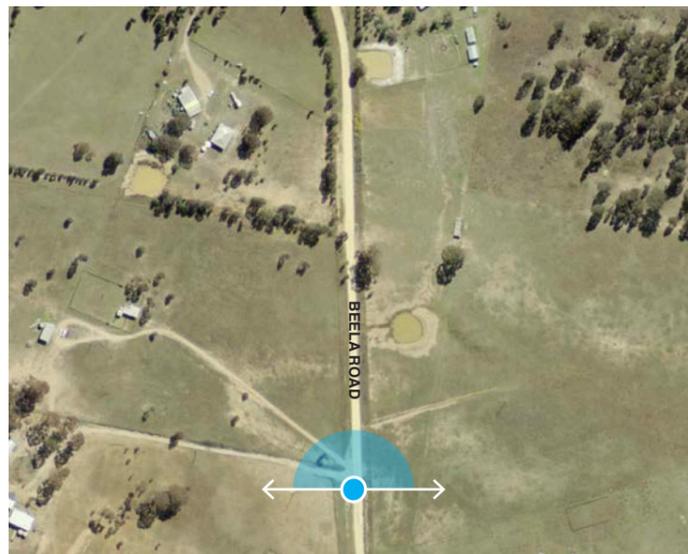


Figure 5: Viewpoint Assessment Locations (Map Source: Six Maps)

6.0 Viewpoint Analysis

SSF01 Beela Road



SSF01 Location

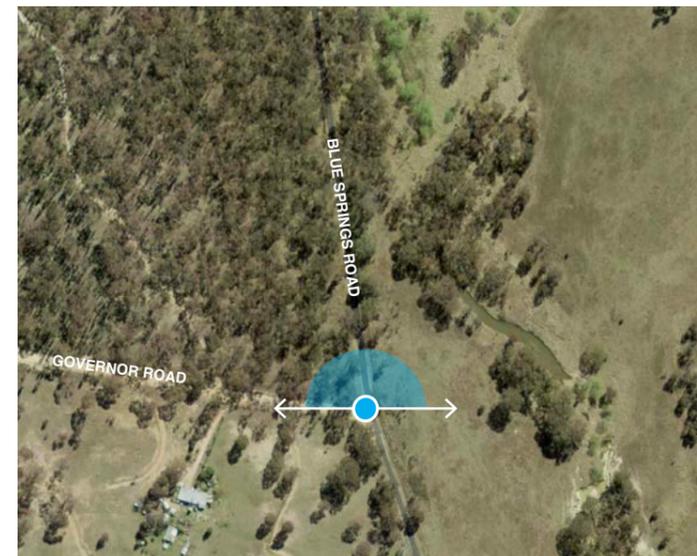
VIEWPOINT SSF01			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Beela Road	Photograph taken from Beela Road, 670m from the intersection with Cope Road. Beela Road is a low use, unsealed road which runs generally north from Cope Road to Carramar Road, servicing approximately 6 rural residential dwellings. Land is generally flat with dense vegetation in the background to the north.	The proposed development will not be visible from this viewpoint as it is concealed by vegetation to the north. The Visual Effect is assessed as nil and the resulting Visual Impact rating is nil .
COORDINATES	32°18'31.34"S 149°35'13.52"E		
ELEVATION	448m		
VIEWING DIRECTION	North		
DISTANCE TO SITE	4.4 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	NIL		
VISUAL IMPACT	NIL		
		Visual sensitivity for low use road is generally low .	

6.0 Viewpoint Analysis

SSF02 Blue Springs Road



LEGEND
 — Indicative extent Project Site likely to be visible
 - - - - - Indicative extent Project Site (Likely to be screened)

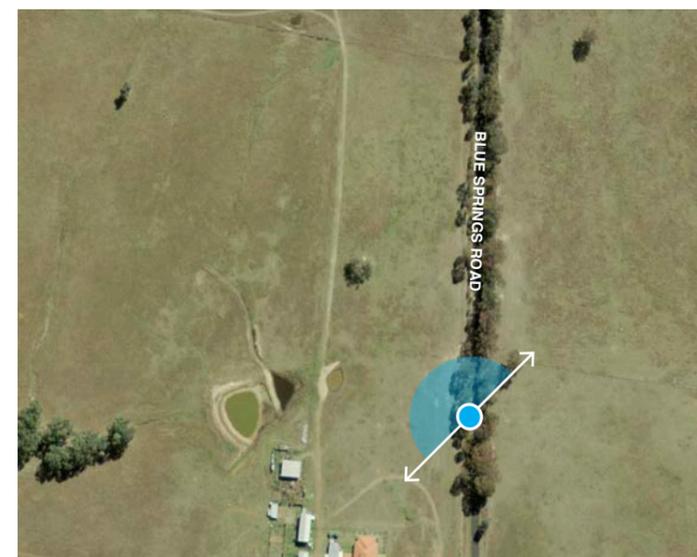
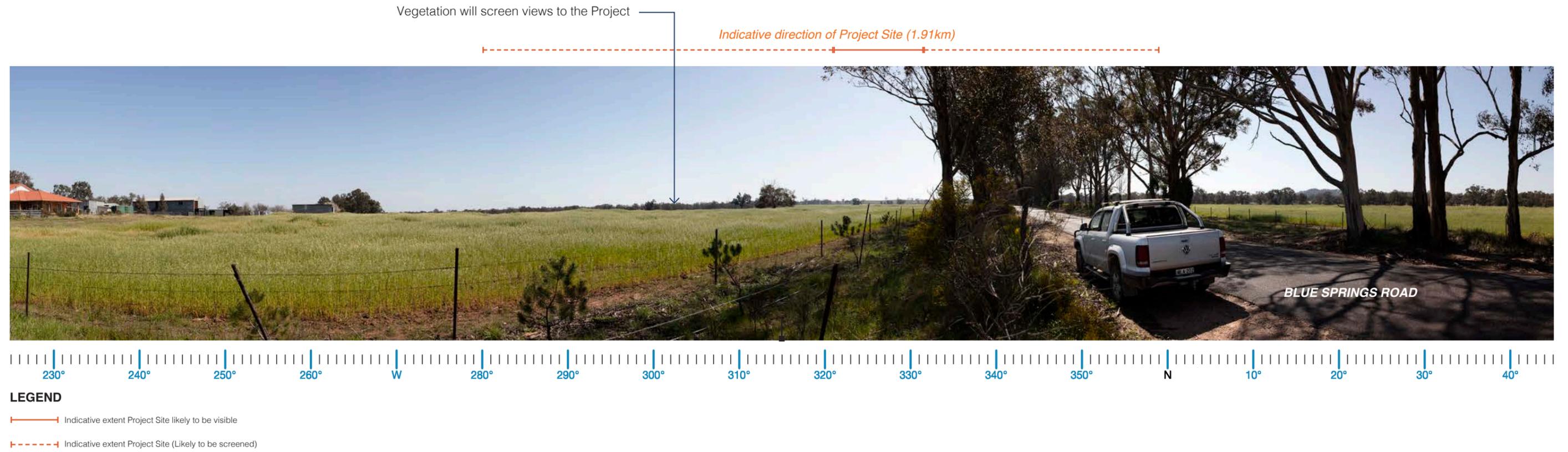


VIEWPOINT SSF02		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
SUMMARY OF VIEWPOINT			
LOCATION	Blue Springs Road	Photograph taken from the corner of Blue Springs Road and Governor Road, approximately 150m north east of a rural residential property. Land is generally flat with dense native vegetation visible in the foreground of the view. Large stands of native vegetation are also visible in the mid ground of the view to the north and east. Visual sensitivity for this viewpoint is low .	The proposed development will not be visible from this viewpoint as it is concealed by vegetation in the fore ground of the view. The Visual Effect is assessed as nil and the resulting Visual Impact rating is nil .
COORDINATES	32°17'32.00"S 149°36'21.98"E		
ELEVATION	467m		
VIEWING DIRECTION	North		
DISTANCE TO SITE	3.25 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	NIL		
VISUAL IMPACT	NIL		

SSF02 Location

6.0 Viewpoint Analysis

SSF03 Blue Springs Road

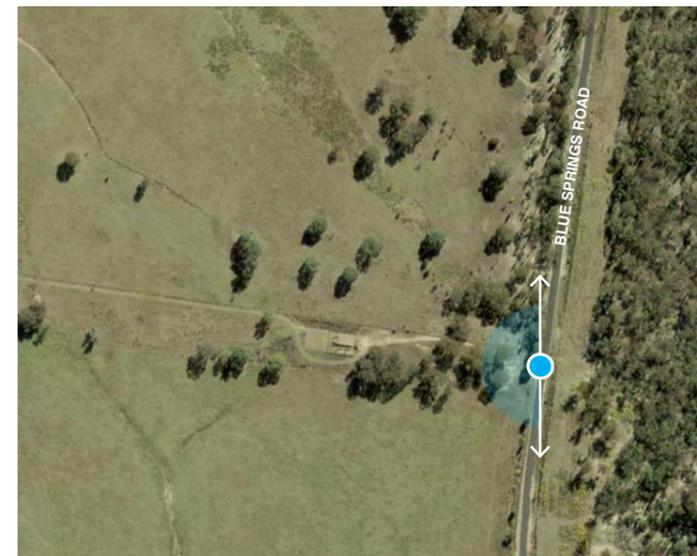


SSF03 Location

VIEWPOINT SSF03			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Blue Springs Road	Photograph taken from Blue Springs Road, approximately 100m north east of a nearby rural residential property. Blue Springs Road is a sealed road that provides access to a number of rural residences and runs north to Birkalla Road and south to Cope Road. Land is generally flat with modified pastures. Roadside vegetation is visible in the foreground to north of the view. Vegetation associated with the creek lines is visible in the distance of the view.	Views towards to the majority of the proposed development are likely to be fragmented in the north by vegetation in the foreground and to the north west by vegetation in the distance. Opportunities to view a small portion of the proposed development are likely to be fleeting and due to the distance, are likely to be difficult to discern from this location.
COORDINATES	32°18'31.34"S 149°35'13.52"E		
ELEVATION	486m		
VIEWING DIRECTION	Generally Northwest		
DISTANCE TO SITE	1.91 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	LOW		
VISUAL IMPACT	LOW		

6.0 Viewpoint Analysis

SSF04 Blue Springs Road



VIEWPOINT SSF04			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Blue Springs Road	Photograph taken from Blue Springs Road, looking south west across flat, modified pastures. The viewpoint is approximately 200m north of the entry to a rural residential property. Blue Springs Road is a sealed road that provides access to a number of rural residences and runs north to Birkalla Road and south to Cope Road. The land is generally flat and cleared with large stands of vegetation located in the foreground along the roadside.	A proposed access road associated with the proposed development is likely to be located to the west of this viewpoint. The proposed access road is likely to be in keeping with the existing character of the landscape. The Visual Effect is assessed as low and the resulting Visual Impact rating is low .
COORDINATES	32°15'49.95"S 149°36'32.12"E		
ELEVATION	506m		
VIEWING DIRECTION	Generally West		
DISTANCE TO SITE	0.80 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	LOW		
VISUAL IMPACT	LOW		

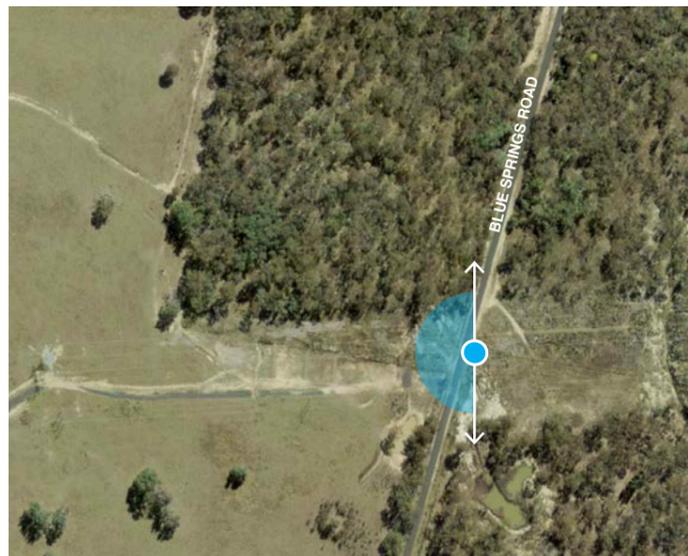
SSF04 Location

6.0 Viewpoint Analysis

SSF05 Blue Springs Road



LEGEND
 ——— Indicative extent Project Site likely to be visible
 - - - - - Indicative extent Project Site (Likely to be screened)

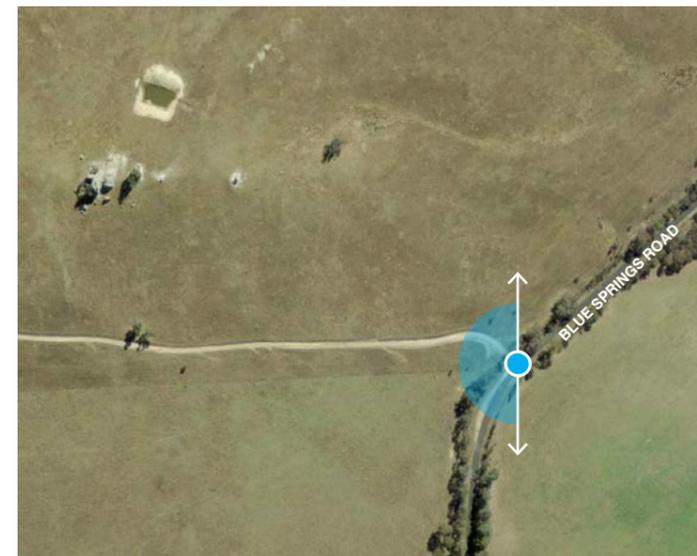
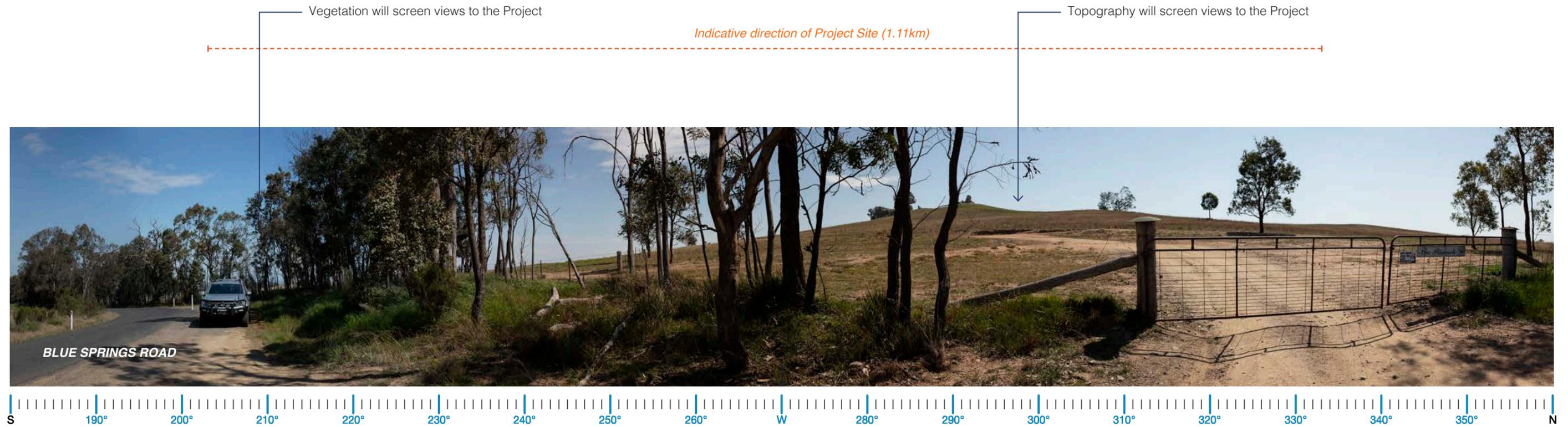


VIEWPOINT SSF05		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
SUMMARY OF VIEWPOINT			
LOCATION	Blue Springs Road	Photograph taken from Blue Springs Road, looking generally west through a break in vegetation associated with the transmission easement. The viewpoint is located approximately 700m north west of a rural residential property. Blue Springs Road is a sealed road that provides access to a number of rural residences and runs north to Birkalla Road and south to Cope Road. Land is generally flat with dense roadside vegetation located in the fore ground of the view.	A small portion of the proposed development is likely to be visible from this viewpoint, however the existing infrastructure visible in the foreground already forms part of the visual character of the landscape. A preferred access track is proposed to be located within the easement to reduce potential for vegetation loss. The Visual Effect is assessed as low and the resulting Visual Impact rating is low .
COORDINATES	32°15'26.74"S 149°36'38.23"E		
ELEVATION	521m		
VIEWING DIRECTION	Generally West		
DISTANCE TO SITE	0.28 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	MODERATE		
VISUAL EFFECT	LOW		
VISUAL IMPACT	LOW		
		Visual sensitivity for this viewpoint is generally moderate .	<i>Refer to Photomontage 01</i>

SSF05 Location

6.0 Viewpoint Analysis

SSF06 Blue Springs Road

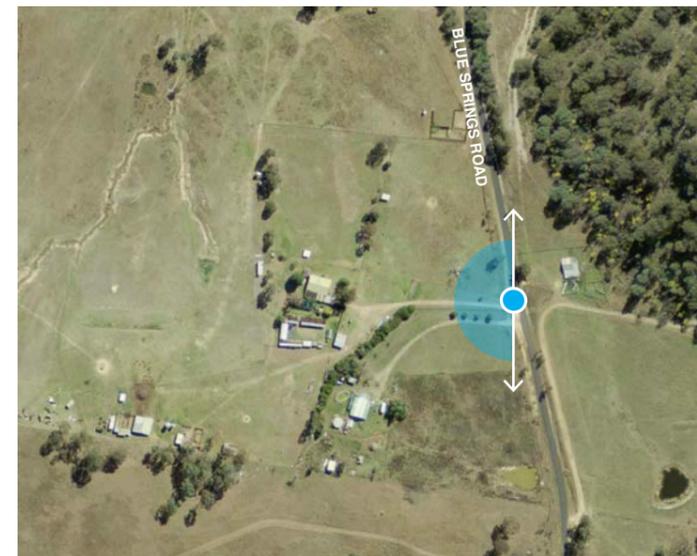


VIEWPOINT SSF06			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Blue Springs Road	Photograph taken from Blue Springs Road at the entry to 'The Pinnacle' rural residence. Land is generally cleared and flat with slight undulations in the fore ground to the west. Scattered roadside vegetation, typical of Blue Springs Road is visible to the south west of the view. Visual sensitivity for this viewpoint is generally low .	The proposed development will not be visible from this viewpoint as it is concealed by topography and vegetation to the east. The Visual Effect is assessed as nil and the resulting Visual Impact rating is nil .
COORDINATES	32°14'32.19"S 149°36'54.95"E		
ELEVATION	560m		
VIEWING DIRECTION	Generally West		
DISTANCE TO SITE	1.11 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	NIL		
VISUAL IMPACT	NIL		

SSF06 Location

6.0 Viewpoint Analysis

SSF07 Blue Springs Road

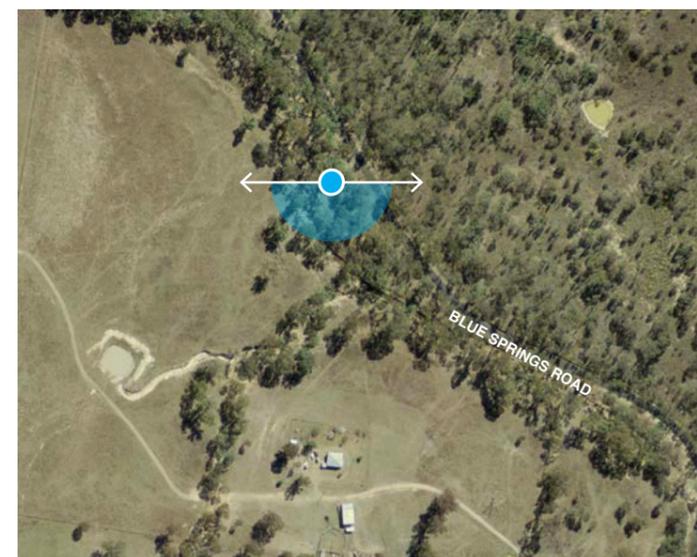
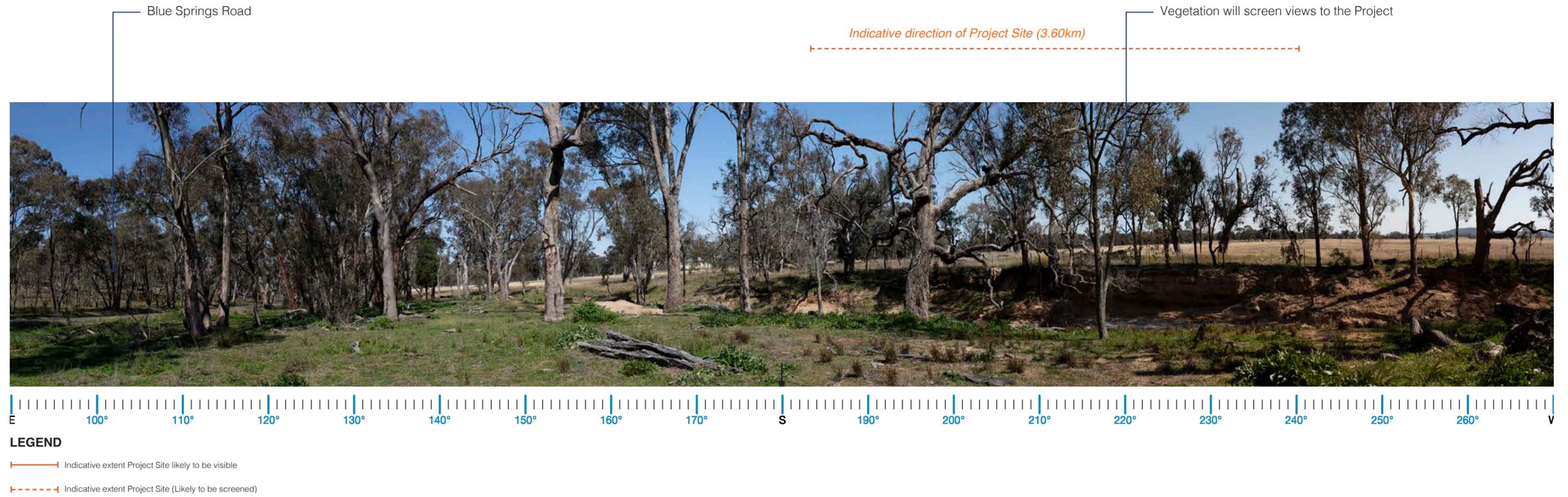


SSF07 Location

VIEWPOINT SSF07		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
SUMMARY OF VIEWPOINT			
LOCATION	Blue Springs Road	Photograph taken from Blue Springs Road, at the driveway of two rural residential properties and approximately 180m north of the entry to another rural residence. Blue Springs Road is a sealed road that provides access to a number of rural residences and runs north to Birkalla Road and south to Cope Road. Land is generally cleared with flat to slightly undulating landform. Scattered vegetation associated with the residences is visible to the west in the fore ground and background of the view.	The proposed development will not be visible from this viewpoint as it is concealed by topography and vegetation to the east. The Visual Effect is assessed as nil and the resulting Visual Impact rating is nil .
COORDINATES	32°13'37.63"S 149°37'31.70"E		
ELEVATION	519m		
VIEWING DIRECTION	Generally West		
DISTANCE TO SITE	2.45 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	NIL		
VISUAL IMPACT	NIL		

6.0 Viewpoint Analysis

SSF08 Blue Springs Road

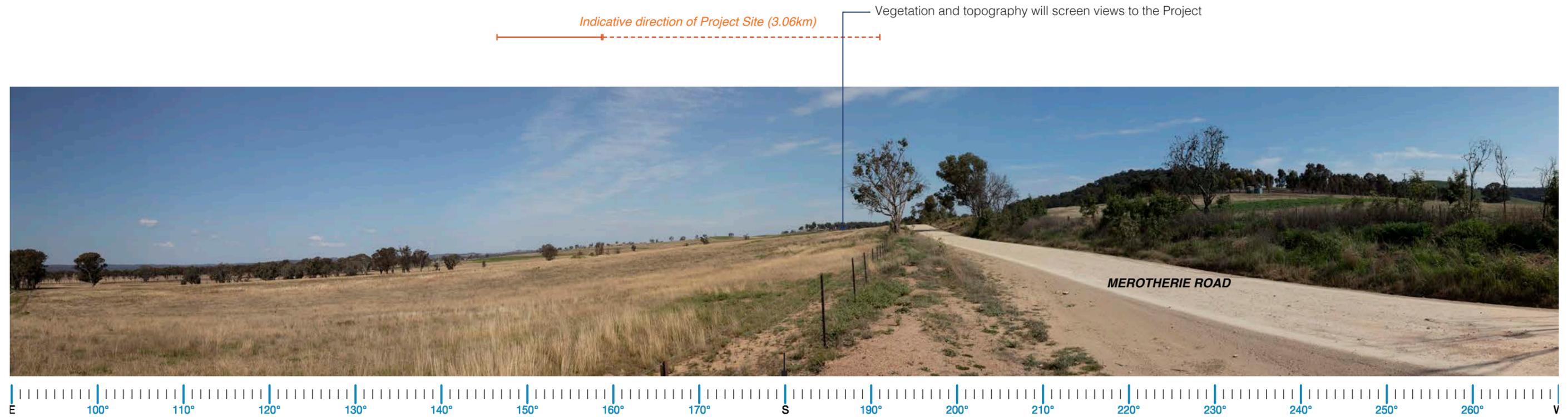


SSF08 Location

VIEWPOINT SSF08			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Blue Springs Road	Photograph taken looking south from Blue Springs Road, 200m north from a rural residence. Cockabutta Creek and its associated vegetation can be seen in the fore ground of the view. Land in the area is characterised by flat grassland with scattered vegetation along creeklines, fencelines and roadsides.	The proposed development will not be visible from this viewpoint as it is concealed by vegetation in the fore ground. The Visual Effect is assessed as nil and the resulting Visual Impact rating is nil .
COORDINATES	32°11'25.37"S 149°37'35.34"E		
ELEVATION	447m		
VIEWING DIRECTION	Generally South		
DISTANCE TO SITE	3.60 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	NIL		
VISUAL IMPACT	NIL		

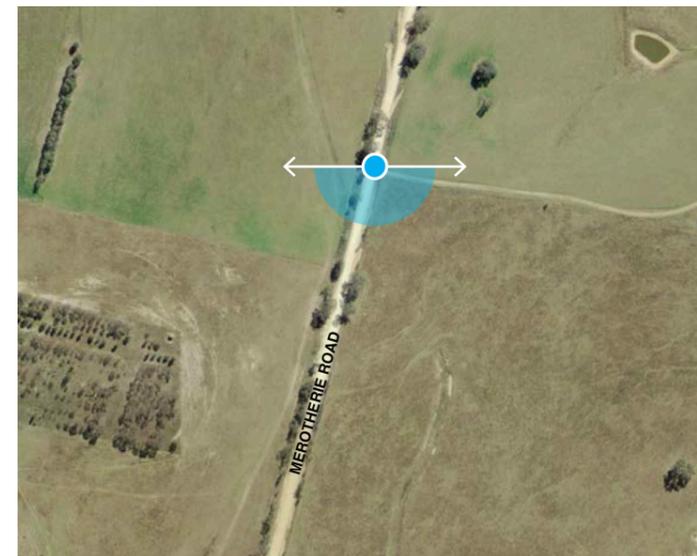
6.0 Viewpoint Analysis

SSF09 Merotherie Road



LEGEND

- Indicative extent Project Site likely to be visible
- - - - Indicative extent Project Site (Likely to be screened)

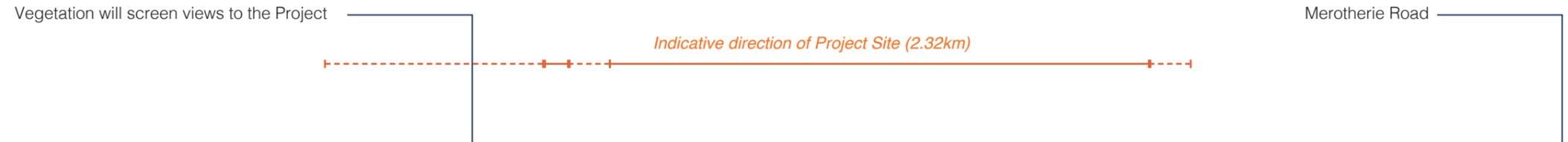


VIEWPOINT SSF09		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
SUMMARY OF VIEWPOINT			
LOCATION	Merotherie Road	Photograph taken from Merotherie Road, 450m south of a rural residence. Merotherie Road runs generally in a north/south direction connecting to Stubbo to the south and the Golden Highway to the north and is used to access approximately 8 rural residences. Land is generally flat, cleared agricultural land with slight undulations in the middle ground to the south east. Vegetation associated with windbreaks and residential properties can be seen in the background of the view.	A small portion of the proposed development may be visible from this viewpoint. A combination of vegetation and distance is likely to fragment the view, making the project difficult to discern from this location. The Visual Effect is assessed as low and the resulting Visual Impact rating is low .
COORDINATES	32°11'1.00"S 149°34'33.53"E		
ELEVATION	486m		
VIEWING DIRECTION	Generally South		
DISTANCE TO SITE	3.06 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	LOW		
VISUAL IMPACT	LOW		
		Visual sensitivity for this viewpoint is generally low .	

SSF09 Location

6.0 Viewpoint Analysis

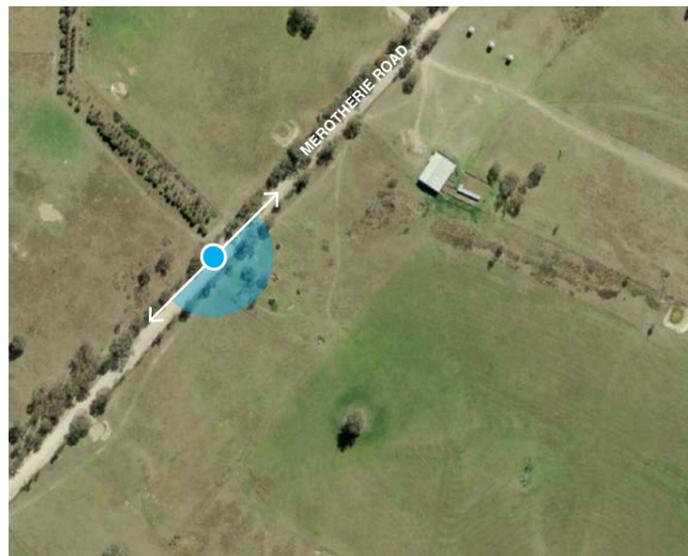
SSF10 Merotherie Road



LEGEND

— Indicative extent Project Site likely to be visible

- - - Indicative extent Project Site (Likely to be screened)



VIEWPOINT SSF10			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Merotherie Road	Photograph taken from Merotherie Road, 400m south of a rural residence. Merotherie Road is used to access approximately 8 rural residences and runs generally in a north/south direction connecting to Barneys Reef Road and eventually Gulgong to the south and the Golden Highway to the north. Scattered road side vegetation can be seen in the fore ground of the view. Land is generally flat to sloping, cleared agricultural land which slopes down to the south east toward Merotherie Creek. Merotherie Creek and its associated vegetation can be seen in the back ground of the view.	Distant views toward the proposed development are likely to be available from this viewpoint. A portion of the proposed development is likely to be screened by vegetation to the south east. The Visual Effect is assessed as low and the resulting Visual Impact rating is low .
COORDINATES	32°11'58.82"S 149°33'51.82"E		
ELEVATION	531m		
VIEWING DIRECTION	Generally Southeast		
DISTANCE TO SITE	2.32 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	LOW		
VISUAL IMPACT	LOW		
		Visual sensitivity for this viewpoint is generally low .	

SSF10 Location

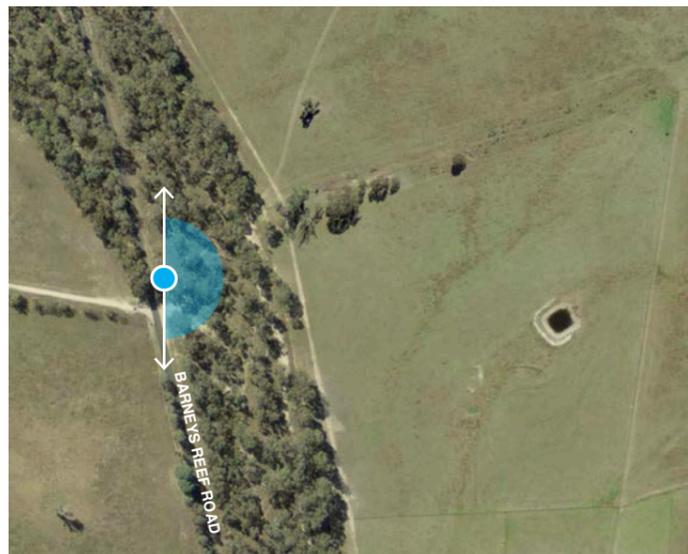
6.0 Viewpoint Analysis

SSF11 Barneys Reef Road



LEGEND

- Indicative extent Project Site likely to be visible
- Indicative extent Project Site (Likely to be screened)



VIEWPOINT SSF11		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
SUMMARY OF VIEWPOINT			
LOCATION	Barneys Reef Road	Photograph taken from Barneys Reef Road at the entry to a rural residence, located 700m to the west of the viewpoint. Barneys Reef Road connects with Merotherie Road to the north and the township of Gulgong to the south. Land is generally flat and predominantly cleared grassland. Roadside vegetation can be seen in the foreground of the view. Visual sensitivity for this viewpoint is generally low .	The proposed development will not be visible from this viewpoint as it is concealed by vegetation in the foreground. The Visual Effect is assessed as nil and the resulting Visual Impact rating is nil .
COORDINATES	32°14'15.19"S 149°32'28.49"E		
ELEVATION	462m		
VIEWING DIRECTION	Generally East		
DISTANCE TO SITE	1.54 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	NIL		
VISUAL IMPACT	NIL		

SSF11 Location

6.0 Viewpoint Analysis

SSF12 Barneys Reef Road

Vegetation will screen views to the Project

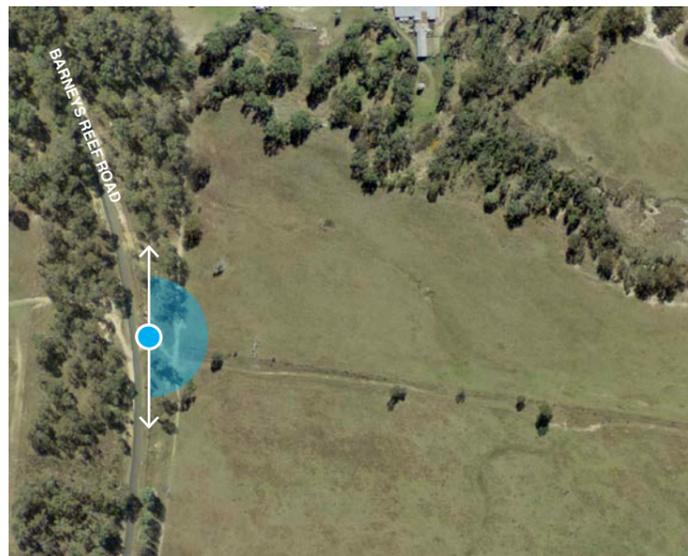
Indicative direction of Project Site (1.36km)



LEGEND

— Indicative extent Project Site likely to be visible

- - - Indicative extent Project Site (Likely to be screened)

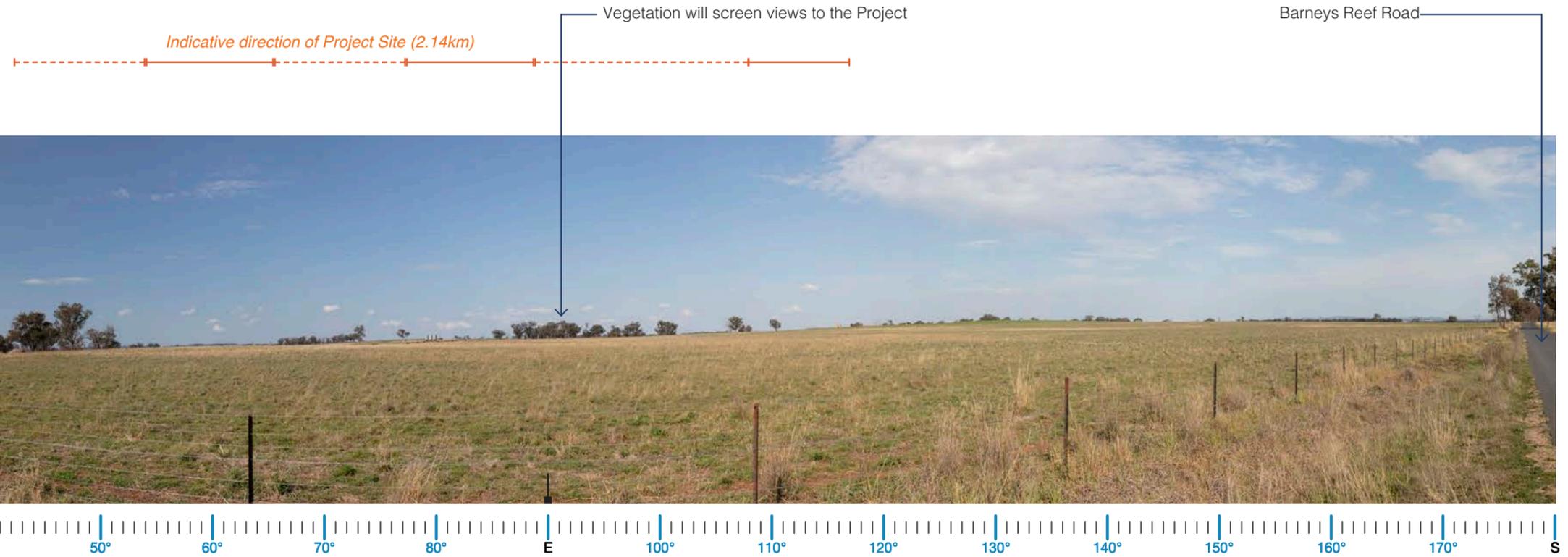


VIEWPOINT SSF12			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Barneys Reef Road	Photograph taken from Barneys Reef Road at the entry to two rural residences, located 250m to the west and 350m north east of the viewpoint. Barneys Reef Road connects with Merotherie Road to the north and the township of Gulgong to the south. Land is generally cleared flat, slightly sloping down to the east. Vegetation associated with the nearby rural residence can be seen in the middle ground of the view.	Views toward a small portion of the proposed development may be available in the break in existing vegetation to the east from this viewpoint. A large portion of the proposed development is likely to be screened by vegetation in the middle ground to the north east. A proposed access road associated with the proposed development is likely to be located to the east of this viewpoint. The Visual Effect is assessed as low and the resulting Visual Impact rating is low . <i>Refer to Photomontage 02</i>
COORDINATES	32°14'35.15"S 149°32'34.08"E		
ELEVATION	462m		
VIEWING DIRECTION	Generally East		
DISTANCE TO SITE	1.36 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	LOW		
VISUAL IMPACT	LOW		

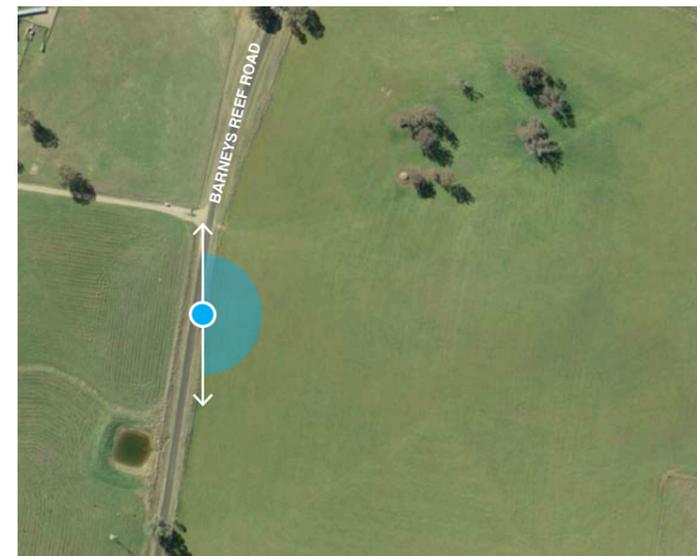
SSF12 Location

6.0 Viewpoint Analysis

SSF13 Barneys Reef Road



LEGEND
 ——— Indicative extent Project Site likely to be visible
 - - - - - Indicative extent Project Site (Likely to be screened)



VIEWPOINT SSF13			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Barneys Reef Road	Photograph taken from Barneys Reef Road 60m south of the entry to a rural residence. Barneys Reef Road connects with Merotherie Road to the north and the township of Gulgong to the south. Land in the area is predominantly cleared flat grassland. A small copse of trees can be seen in the middle ground to the north east of the view. Vegetation associated with the Stubbo Creek can be seen in the background of the view. Visual sensitivity for this viewpoint is generally low .	Distant views toward a small portion of the proposed development may be available from this viewpoint, however opportunities to view the proposed development are likely to be fleeting and due to the distance, are likely to be difficult to discern from this location. A large portion of the proposed development is likely to be screened by vegetation associated with Stubbo Creek in the back ground. The Visual Effect is assessed as low and the resulting Visual Impact rating is low .
COORDINATES	32°16'9.67"S 149°32'7.93"E		
ELEVATION	448m		
VIEWING DIRECTION	Generally East		
DISTANCE TO SITE	2.14 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	LOW		
VISUAL IMPACT	LOW		

SSF13 Location

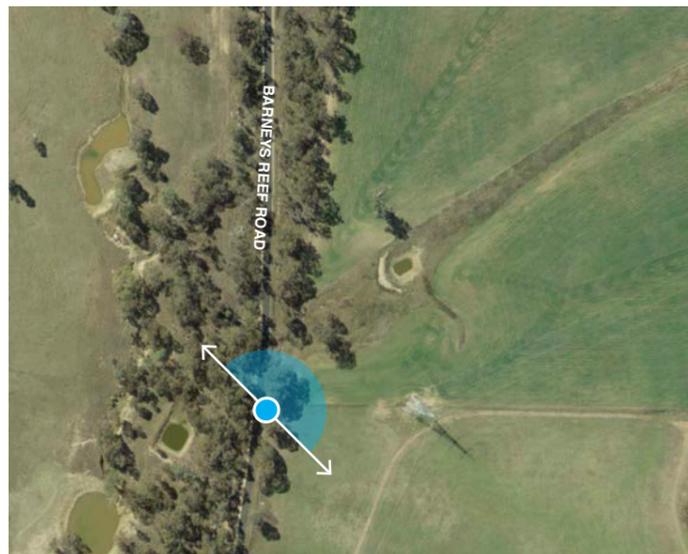
6.0 Viewpoint Analysis

SSF14 Barneys Reef Road



LEGEND

- Indicative extent Project Site likely to be visible
- Indicative extent Project Site (Likely to be screened)

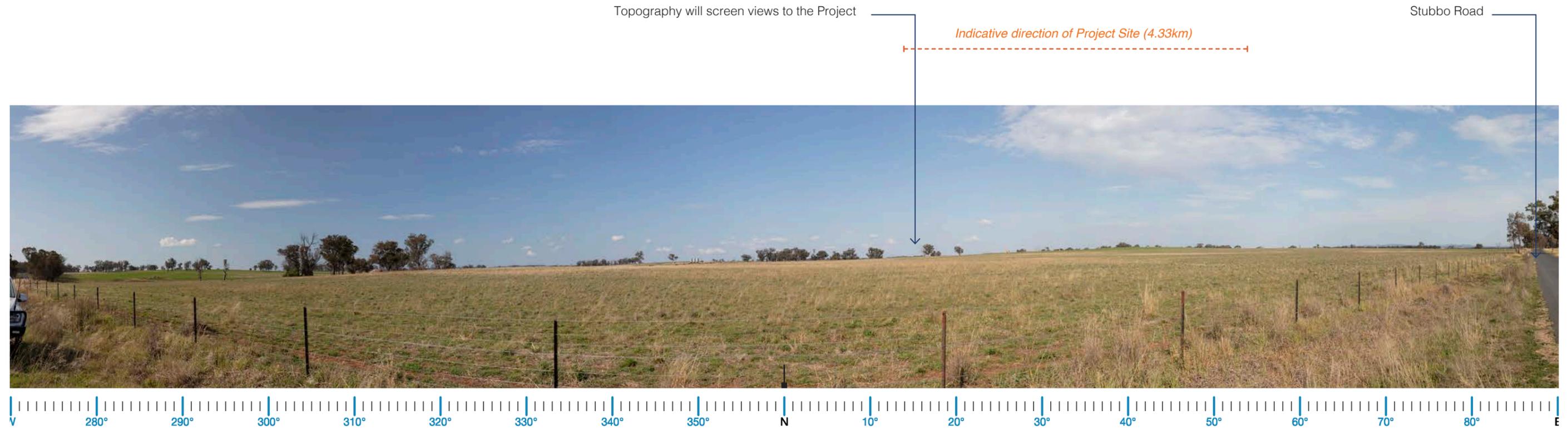


SSF14 Location

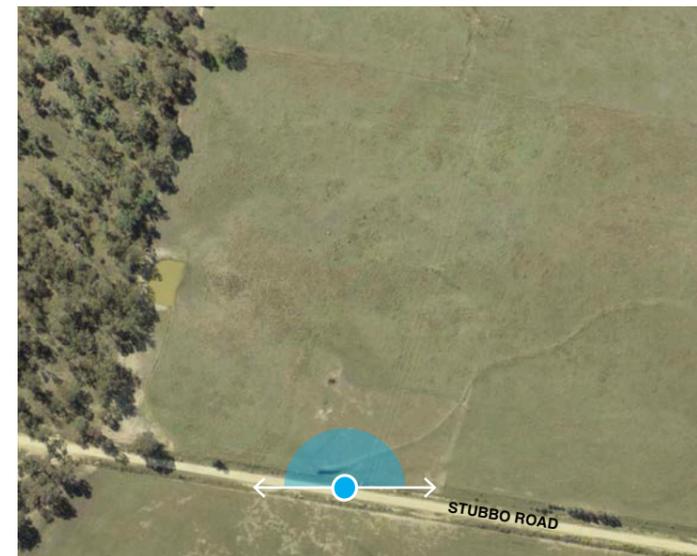
VIEWPOINT SSF14			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Barneys Reef Road	Photograph taken from Barneys Reef Road which connects with Merotherie Road to the north and to the township of Gulgong to the south. Land in the area is mostly cleared and generally flat. Road side vegetation is visible to the north in the foreground of the view. Remnant stands of native vegetation can be seen in the middle ground and background of the view to the north east. Vegetation associated with Stubbo Creek can be seen in the distance of the view. Transmission towers are visible in the middle ground and background of the view. Visual sensitivity for this viewpoint is generally low .	The proposed development is likely to be largely screened by the existing vegetation in the north east of the view, with the exception of a small portion that may be available at the break in vegetation. Due to the distance, views toward this portion of the development are likely to be fleeting and difficult to discern. The Visual Effect is assessed as low and the resulting Visual Impact rating is low .
COORDINATES	32°17'6.48"S 149°31'57.51"E		
ELEVATION	440m		
VIEWING DIRECTION	Generally Northeast		
DISTANCE TO SITE	3.31 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	LOW		
VISUAL IMPACT	LOW		

6.0 Viewpoint Analysis

SSF15 Stubbo Road



LEGEND
 ——— Indicative extent Project Site likely to be visible
 - - - - - Indicative extent Project Site (Likely to be screened)



VIEWPOINT SSF15			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Stubbo Road	Photograph taken from Stubbo Road, approximately 500m west of the entry to a rural residence. Stubbo Road runs generally east west off Barneys Reef Road, turning into Carramar Road to the east. Stubbo Road is a sealed road used to access approximately 11 rural residences. Land is generally flat with slight undulations in the back ground to the north east. Scattered vegetation is visible in the middle ground and background of the view.	The proposed development will not be visible from this viewpoint as it is concealed by topography to the north east. The Visual Effect is assessed as nil and the resulting Visual Impact rating is nil .
COORDINATES	32°17'51.00"S 149°32'16.86"E		
ELEVATION	433m		
VIEWING DIRECTION	Generally North		
DISTANCE TO SITE	4.33 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	NIL		
VISUAL IMPACT	NIL		

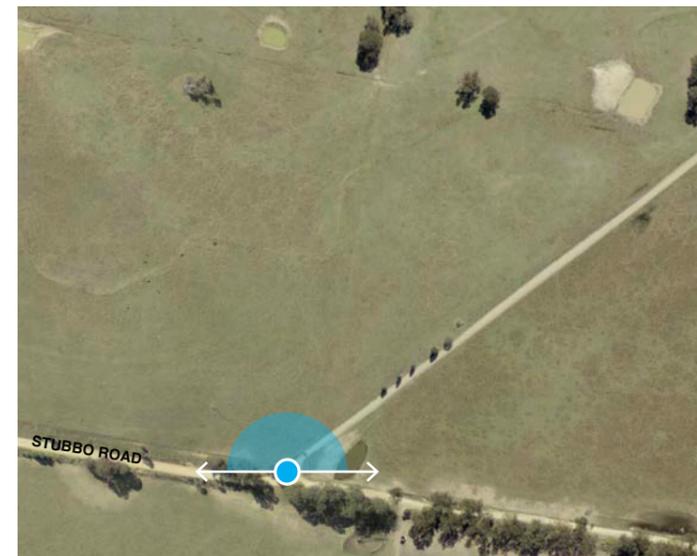
SSF15 Location

6.0 Viewpoint Analysis

SSF16 Stubbo Road



LEGEND
 ——— Indicative extent Project Site likely to be visible
 - - - - - Indicative extent Project Site (Likely to be screened)



VIEWPOINT SSF16			
SUMMARY OF VIEWPOINT		VIEWPOINT DESCRIPTION	POTENTIAL VISUAL IMPACT
LOCATION	Stubbo Road	Photograph taken from Stubbo Road, from the driveway entry to 'Sanslee'. Stubbo Road runs generally east west off Barneys Reef Road, turning into Carramar Road to the east. Stubbo Road is a dirt road used to access approximately 11 rural residences. Land is generally flat and gently slopes down to Stubbo Creek in the background to the north west of the view. Scattered vegetation associated with the Stubbo Creek can be seen in the background. Remnant native stands of vegetation are visible to the north in the distance of the view.	The proposed development is likely to be largely screened by the existing vegetation in the north of the view, with the exception of a small portion that may be available at the break in vegetation. Due to the distance, views toward this portion of the development are likely to be fleeting and difficult to discern. The Visual Effect is assessed as low and the resulting Visual Impact rating is low .
COORDINATES	32°17'53.95"S 149°32'36.83"E		
ELEVATION	440m		
VIEWING DIRECTION	Generally North		
DISTANCE TO SITE	4.02 km		
LAND USE	Low Use Road		
VISUAL SENSITIVITY	LOW		
VISUAL EFFECT	LOW		
VISUAL IMPACT	LOW		
		Visual sensitivity for rural residence is generally low .	

SSF16 Location

6.0 Viewpoint Analysis

6.2 Overview of Viewpoint Analysis

As discussed in the rationale for the viewpoint selection process, these viewpoints are representative of the worst case scenario. For each viewpoint, the potential visual impact was analysed through the use of a combination of topographic maps and on site analysis.

The visual sensitivity and visual effect of each viewpoint have been assessed which, when combined, result in an overall visual impact for the viewpoint (**Refer to Table 3**).

Of the 16 viewpoints assessed as part of this VIA, the proposal would be visible from a total of 9 viewpoints. Of the 9 viewpoints from which the proposal would be visible, all received a visual impact rating of 'low'.

It is noted visual impacts associated with the proposed development are likely to be higher during the construction phases and mitigated overtime with the implementation of measures to ultimately achieve a low or negligible visual impact level. The incorporated mitigation measures outlined in **Section 8** of this report seek to avoid, reduce and where possible remedy adverse visual effects arising from the proposed development.

Generally, there are very limited opportunities to view the Project. The viewpoints that were rated as low contained limited views to the Site, adequate screening or roadside vegetation obscure views.

The viewpoints which were rated as having potential views to the Site were taken within close proximity of the proposal in locations where there was an absence of existing vegetation to screen views into the proposed development.

Viewpoint	Location	VISUAL SENSITIVITY	VISUAL EFFECT	POTENTIAL VISUAL IMPACT
SSF01	Beela Road	LOW	NIL	NIL
SSF02	Blue Springs Road	LOW	NIL	NIL
SSF03	Blue Springs Road	LOW	LOW	LOW
SSF04	Blue Springs Road	LOW	LOW	LOW
SSF05	Blue Springs Road	MODERATE	LOW	LOW
SSF06	Blue Springs Road	LOW	NIL	NIL
SSF07	Blue Springs Road	LOW	NIL	NIL
SSF08	Blue Springs Road	LOW	NIL	NIL
SSF09	Merotherie Road	LOW	LOW	LOW
SSF10	Merotherie Road	LOW	LOW	LOW
SSF11	Barneys Reef Road	LOW	NIL	NIL
SSF12	Barneys Reef Road	LOW	LOW	LOW
SSF13	Barneys Reef Road	LOW	LOW	LOW
SSF14	Barneys Reef Road	LOW	LOW	LOW
SSF15	Stubbo Road	LOW	NIL	NIL
SSF16	Stubbo Road	LOW	LOW	LOW

*Please note the Viewpoint Visibility Assessment Summary is based on the visibility assessment criteria outlined in Section 2.1 of this report.

Table 3: Viewpoint Visual Impact Summary

7.0 Photomontages

7.1 Photomontage Development

A photomontage is a visualisation based on the superimposition of an image (ie building, road, landscape addition etc) onto a photograph for the purpose of creating a realistic representation of proposed or potential changes to a view. (Horner and MacLennan et al, 2006). Photomontages have been utilised in this Landscape and Visual Impact Assessment to assist in the impact assessment of the proposed Solar Farm.

7.1.1 Photomontage Development Process

Photomontages are representations of the development that are superimposed onto a photograph of The Site. The process for generating these images involves computer generation of a wire frame perspective view of The Site. Due to the character of this development being a progression which will occur over time, the photomontages developed for this proposal are based on a worst case scenario at a height of up to 4.3 metres.

The photo simulations based on photography from typical sensitive viewpoints are included within the following analysis section. The images that the photo simulations have been based on have been captured with a Canon EOS 50D Mark IV Full Frame Digital SLR through a 50mm fixed focal lens which closely represent the central field of vision of the human eye.

7.1.2 Photomontage Selection Process.

Two photomontages of the proposed development within the existing context were selected as key views and as a good indicator of general visibility of the Site. Photomontages have been prepared for Viewpoint SSF05 and SSF12 (refer to **Figure 6**). When undertaking a LVIA, viewpoints selected for the preparation of photomontages are generally those viewpoints determined to have the greatest potential for visibility of the project and the highest visual impact. Due to existing roadside vegetation and very low visibility of the project, the two viewpoints are representative of the nearest public viewpoints with visibility towards of the Project.

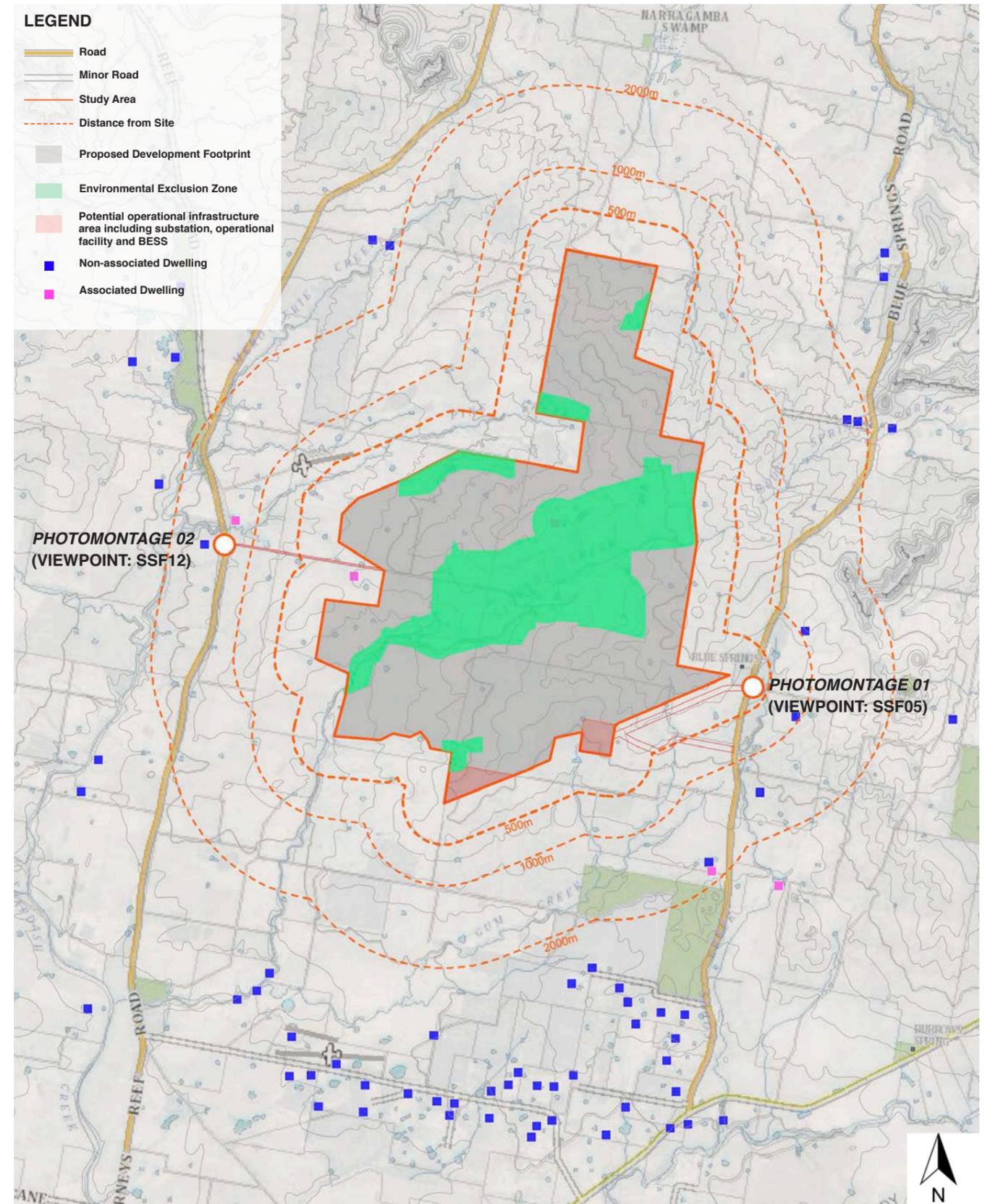


Figure 6: Photomontage Locations (Map source: Six Maps 2020)

7.0 Photomontages

Photomontage 01 (Viewpoint SSF05)

180° Existing View



180° Proposed View



Refer to cropped 60° image

7.0 Photomontages

Photomontage 01: Cropped 60° of Proposed View



230°

240°

250°

260°

W

280°

290°

7.0 Photomontages

Photomontage 02 (Viewpoint SS12)

180° Existing View



180° Proposed View



Refer to cropped 60° image

7.0 Photomontages

Photomontage 02: Cropped 60° of Proposed View



8.0 Visual Impact Assessment

8.1 Overview of Visual Impacts

In addition to the photographic viewpoint assessment, the following section provides an overview of the potential visibility from areas surrounding the site. This is by no means an exhaustive description of the visibility from every locality, it is intended to provide an overall assessment of the potential visual impact on areas potentially affected by the proposal.

8.2 Overview of Visual Impact on Public Land

Overall the proposed development will result in very minor modification to the existing visual landscape. There will be very limited opportunities to view the Project from publicly accessible land and no accessible viewing locations within the Study Area to view the Project in its entirety. Due to the relatively small vertical scale, existing landscape features including roadside vegetation and topography screen the proposal from the majority of locations.

Publicly accessible viewing locations are generally limited to the minor roads which transverse the landscape. These roads have a very low frequency of use, providing access to isolated dwellings. The highest visual effect is likely to be experienced from areas within close proximity to the Site, however due to the isolated location, there is no publicly accessible land within close proximity to the Site.

The Site is set back from all roads by at least 1000 metres. An exception of this is a small portion of Blue Springs Road where the Site boundary is located within relatively close proximity, however roadside vegetation and direction of travel along this road would limit opportunities to view the Project. Views may be available to the Site along the existing cleared transmission line easement when travelling in a north direction along Blue Springs Road. **Photomontage 01** illustrates the very low visibility of the Project in this location. Views to the Project are likely to be limited reduced to a fleeting glimpse that is unlikely to be noticeable to the general public.

Some fleeting and distant glimpses may also be available from Barneys Reef Road. **Photomontage 02** has been prepared from Barneys Reef Road and illustrates the small portion of the proposal which is likely to be visible. The speed and direction of travel along this road would make the Project difficult to discern.

Due to the existing land use of grazing and modified pasture, land has been extensively cleared. The project is likely to require the removal of a small amount of scattered vegetation which in the context of the broader landscape would have a negligible visual impact. The potential for visual impacts will occur during the construction and operational stages of the project. The Site will be altered as a result of the project, however once decommissioned, the visual landscape has the capacity to return to the current state.

8.3 Overview of Visual Impact on Residences

Dwellings within 2000 metres:

The highest potential visual impact is likely to be experienced from dwellings within close proximity to the Site. The assessment identified a total of seven (7) dwellings located within 2000 metres of the Project. For the purpose of this LVIA, dwellings within 2000 metres of the Site have been assigned an ID (refer to **Figure 7**) and an assessment from each has been outlined in **Table 5**. The Zone of Visual Influence illustrated topography will screen views from four (4) of these dwellings (R4, R5, R6 and R10).

Of the remaining three (3) dwellings with potential views (R7, R9 and R8), detailed assessment using aerial imagery identified the proposal will be screened by vegetation.

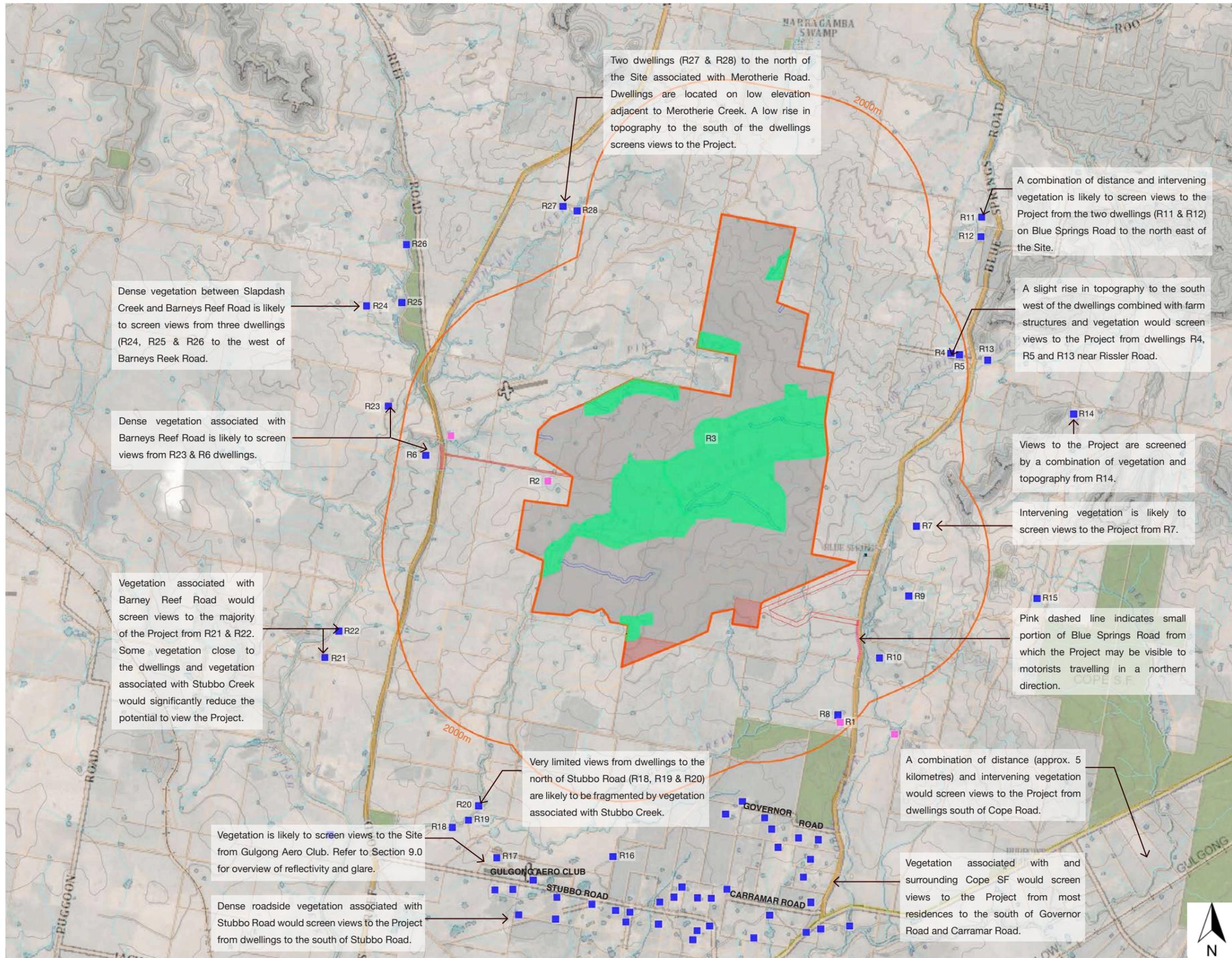
Dwellings in excess of 2000 metres:

Stubbo is the most populated area within close proximity to the Project Site. Stubbo is characterised by rural residential properties that are located to the south of the Site. An overview of potential visibility from all dwellings identified within 5 kilometres of the Project Site has been provided in **Table 6**.

Views to the Project are likely to be screened by vegetation from dwellings associated with Governor Road, Carramar Road, Cope Road and the southern side of Stubbo Road.

If deemed necessary, mitigation methods outlined in **Section 10.0** would significantly reduce any residual visual impacts resulting from the Project.

8.0 Visual Impact Assessment



Visual Impact Assessment Stubbo Solar Farm

LEGEND

- Project Boundary
- Proposed development footprint
- Potential operational infrastructure area including substation, operational facility and BESS
- Environmental Exclusion Zone
- Associated Dwelling
- Non-associated Dwelling
- Extent of road from which Project may be visible
- 2000m from Project Boundary
- Clearing in roadside vegetation

Figure 7 Visual Impact Assessment (Map source: Six Maps)

8.0 Visual Impact Assessment

Dwelling	Location	Distance to the Project	Extent of visibility based on ZVI	Visual Assessment	Potential Glare	Recommended Mitigation Measures (Refer to Section 10.0)
Non-associated dwellings within 2000m of the Project						
R4	917 Blue Springs Road, Stubbo	1915m	Nil	The Project is located to the south west of this dwelling. A low rise in topography is likely to screen views to the project from this dwelling.	Nil	Not required.
R5	915 Blue Springs Road, Stubbo	1932m	Nil	The project is located to the south west of this dwelling. A low rise in topography is likely to screen views to the project from this dwelling.	Nil	Not required.
R6	1251 Barneys Reef Road, Stubbo	1635m*	Nil	A combination of topography and dense roadside vegetation associated with Barney Reef Road would screen views to the Project from this dwelling.	Nil	Not required.
R7	654 Blue Springs Road, Stubbo	1069m	1-25%	Dwelling is located on a slight rise in topography on the eastern side of Blue Springs Road. The potential to view the Project is limited due to intervening vegetation (to the west of the dwelling) associated with Blue Springs Road.	Nil	Not required.
R8	305 Blue Springs Road, Stubbo	1410m	1-25%	Views towards to the Project from this dwelling are likely to be fragmented by vegetation associated with Gum Creek. There is potential for a small portion of the Project to be visible in the distance to the north west, however the Project would occupy only a small portion of the view and be difficult to discern from this distance.	Nil	Not required.
R9	440 Blue Springs Road, Stubbo	680m	1-25%	Dwelling is located on a slightly elevated position to the east of Blue Springs Road. The potential to view the Project is limited due to intervening vegetation (to the north west of the dwelling) associated with Blue Springs Road.	Nil	Not required.
R10	384 Blue Springs Road, Stubbo	585m	Nil	Dwelling is surrounded by vegetation to the east of Blue Springs Road. It is unlikely views to the Project will be visible from this dwelling due to the vegetation.	Nil	Not required.

**The distance given to the study area for this dwelling is measured to the closest area to be developed with solar arrays. The distance to the proposed emergency access is approximately 285 meters however this distance is not considered relevant to the visual assessment due to the minor visual effects associated with the development of the emergency access.*

Table 5: Overview of non-associated dwellings within 2000m of the Project

8.0 Visual Impact Assessment

Dwelling	Location	Distance to the Project	Extent of visibility based on ZVI	Visual Assessment	Potential Glare	Recommended Mitigation Measures (Refer to Section 10.0)
Non-associated dwellings within 2000 - 5000m of the Project						
R11	1083 Blue Springs Road	2.78km	1-25%	Dwelling appears to be surrounded by vegetation and views would therefore be screened.	Nil	Not required.
R12	1083 Blue Springs Road	2.76km	1-25%	Intervening vegetation between the dwelling and Project Site is likely to screen views.	Nil	Not required.
R13	898 Blue Springs Road	2.31km	Nil	Not visible due to topography.	Nil	Not required.
R14	802 Blue Springs Road	3.65km	Nil	Not visible due to topography.	Nil	Not required.
R15	656 Blue Springs Road	2.84km	Nil	Not visible due to topography.	Nil	Not required.
R16	354 Carramar Road	2.82km	1-25%	Intervening vegetation to the north of the dwelling is likely to screen views to the Project Site.	Nil	Not required.
R17	Gulgong Aero Club	3.37km	1-25%	Intervening vegetation to the north of the building is likely to screen views to the Project Site.	Nil	Not required.
R18	97 Stubbo Road	3.40km	1-25%	A combination of distance and intervening vegetation between the dwelling and Project Site is likely to screen views.	Nil	Not required.
R19	99 Stubbo Road	3.17km	1-25%	Intervening vegetation between the dwelling and Project Site is likely to screen views.	Nil	Not required.
R20	101 Stubbo Road	2.92km	1-25%	Intervening vegetation between the dwelling and Project Site is likely to screen views.	Nil	Not required.
R21	913 Barneys Reef Road	3.06km	1-25%	Vegetation associated with Barneys Reef Road and Stubbo Creek will screen views to the Site.	Nil	Not required.
R22	955 Barneys Reef Road	2.82km	1-25%	Vegetation associated with Barneys Reef Road and Stubbo Creek will screen views to the Site.	Nil	Not required.

Table 6: Overview of non-associated dwellings within 2000 - 5000m of the Project

8.0 Visual Impact Assessment

Dwelling	Location	Distance to the Project	Extent of visibility based on ZVI	Visual Assessment	Potential Glare	Recommended Mitigation Measures (Refer to Section 10.0)
Non-associated dwellings within 2000 - 5000m of the Project						
R23	1309 Barneys Reef Road	2.23km	25-50%	Roadside vegetation associated with Barneys Reef Road will screen views to the Project Site.	Nil	Not required.
R24	1451 Barneys Reef Road	3.16km	25-50%	Roadside vegetation associated with Barneys Reef Road will screen views to the Project Site.	Nil	Not required.
R25	1449 Barneys Reef Road	2.80km	1-25%	Vegetation between Slapdash Creek and with Barneys Reef Road will screen views to the Project Site.	Nil	Not required.
R26	1535 Barneys Reef Road	3.38km	1-25%	Vegetation between Slapdash Creek and with Barneys Reef Road will screen views to the Project Site.	Nil	Not required.
R27	272 Merotherie Road	2.40km	Nil	Not visible due to topography.	Nil	Not required.
R28	272 Merotherie Road	2.08km	Nil	Not visible due to topography.	Nil	Not required.
Governor Road	Dwellings associated with Governor Road	Varies (in excess of 2.4km)	Nil / 1-25%	Views from dwellings associated with Governor Road will be screened by dense vegetation to the north.	Nil	Not required.
Carramar Road	Dwellings associated with Carramar Road	Varies (in excess of 3.8km)	Nil / 1-25%	Views from dwellings associated with Carramar Road will be screened by dense vegetation to the north.	Nil	Not required.
Stubbo Road	Dwellings associated with Stubbo Road	Varies (in excess of 3.4km)	Nil / 1-25%	Dwellings associated with Stubbo Road are generally located on the south of Stubbo Road. Roadside vegetation associated with Stubbo Road will screen views to the Site.	Nil	Not required.

Table 6 (CONTINUED): Overview of non-associated dwellings within 2000 - 5000m of the Project

8.0 Visual Impact Assessment

8.4 Cumulative Visual Impacts

Cumulative landscape and visual effects result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it) or actions that occurred in the past, present or are likely to occur in the foreseeable future (Landscape Institute et al, 2008). Cumulative effects may also affect the way a landscape is experienced and can be positive or negative. Where they comprise benefits, they may be considered to form part of the mitigation measures.

A cumulative impact assessment has several dimensions:

- The impact of the solar farm when added to the combined impacts of all other existing developments and environmental characteristics of the area.
- The impact of this development in the context of the potential for development of solar energy developments in the local, regional and national context.
- The impact of developments which are ancillary to or otherwise associated with the proposed solar farm eg. the development of substations and associated infrastructure.
- The potential for future development of solar farms in the region.

Beryl Solar Power Plant

The nearest constructed and operating solar farm to the Project is the Beryl Solar Power Plant located approximately five kilometres west of Gulgong, approximately 12 kilometres south east of the Stubbo Solar Farm. There are no viewing locations from which both solar farms would be visible.

At the time of lodgement, two proposed / approved solar farms within the wider regional context include:

Dunedoo Solar Farm

The proposed Dunedoo Solar Farm is located approximately two kilometres north of Dunedoo. The Environmental Impact Statement (EIS) was submitted to the Department of Planning, Infrastructure and Environment for assessment in September 2020. The Dunedoo Solar Farm is located approximately 30 kilometres to the north east of the proposed Stubbo Solar Farm. There are no opportunities to view the two solar farms simultaneously.

Wollar Solar Farm

Development Consent granted by the Minister for Planning and Public Spaces on 24 February 2020. Located approximately 35 kilometres to the south east of the proposed Stubbo Solar Farm. There are no opportunities to view both solar farms at the same time.

Due to distance there are no opportunities to view any additional solar farms simultaneously from a static viewpoint presently or in the foreseeable future.

The potential cumulative visual impact must also be assessed in relation to the potential visual impact when viewed sequentially. If a number of solar farms are viewed in succession as a traveller moves through the landscape (eg. motorist travel routes or walking tracks) this may result in a change in the overall perception of the landscape character. The viewer may only see one solar farm at a time, but if each successive stretch of the road is dominated by views of a solar farm, then that can be argued to be a cumulative visual impact (EPHC, 2010). Due to the relatively isolated location, the Project is set back from major travel routes which prevents any opportunities to view solar farms in succession along travel routes.

8.0 Visual Impact Assessment

8.5 Assessment of Associated Infrastructure

A summary of the proposed infrastructure can be found in **Section 3.0**.

8.5.1 Substation and Battery Energy Storage System (BESS)

Both the proposed substation and BESS location options are situated on the southern end of the Site in a generally isolated location adjacent to the existing 330 kV transmission line. The footprint of the substation is indicative and not all will be built form. The majority of the substation will remain under 10m high. If mitigation methods outlined in **Section 10.0** of this report are employed, overtime the proposed substation will be screened at either location.

8.5.2 Transmission Lines

Transmission lines feature in the existing landscape and form part of the existing landscape character of the area. 33-kilovolt overhead or underground electrical reticulation are being considered to connect the invertor stations to the onsite substation. Connection from the substation will be to the existing 330-kilovolt transmission line to the south of the Site. If underground powerlines are selected, visual impact would be negligible.

8.5.3 Site Access and Facilities

Two external access roads are proposed, one to the east will provide access to Blue Spring Road and one to the west will connect with Barneys Reef Road. The proposed access roads have been sited to reduce potential visual impacts and will be in keeping with existing farm roads within the study area.

Facilities for the operation of the proposal include an operations and maintenance facility including staff office, meeting facilities and amenities, storage facilities, workshops and car parking facilities. The appearance of these facilities are in keeping with existing farm structures within the landscape. Recommendations to reduce any potential visual impacts of these facilities have been included in **Section 10.0**.

9.0 Nightlighting, Reflectivity and Glare

9.1 Night lighting

There will be no permanent night lighting installed within the solar farm array. Night lighting will only be used in the case of maintenance and in the event of an emergency and would be designed to ensure it reduces disturbance to neighbouring properties.

The proposal is located within 200 kilometres of Siding Spring Observatory. *The Dark Sky Planning Guidelines* adopted by the Department of Planning and Environment in June 2016 provides guidance and technical information on good lighting design and encourages the use of shielded, downward facing and site appropriate lighting.

It is recommended any lighting to be installed for safety and security on site is in accordance with AS4228-1997 - Control of Obtrusive Effects of Outdoor Lighting. Lighting is also to be designed with regards to principles identified within the *Dark Sky Planning Guidelines*. These include:

1. Eliminate upward spill light
2. Direct light downwards, not upwards
3. Use shielded fittings
4. Avoid 'over' lighting
5. Switch lights off when not required
6. Use energy efficient bulbs
7. Use asymmetric beams, where floodlights are used
8. Ensure lights are not directed towards reflective surfaces
9. Use warm white colours

9.0 Nightlighting, Reflectivity and Glare

9.2 Reflectivity and Glare

Due to the materials used in the construction of PV panels being primarily glass and steel there is a perceived issue of glint and glare surrounding the reflectivity solar panels. As a result of the perceived reflection levels, there is a concern of possible distractions to motorists, aircraft and the hazard of eye damage.

Solar panels are designed to absorb the sun energy and directly convert it to electricity. The solar panels are designed using anti-reflective solar glass effectively reducing reflectivity. Thin slivers of metal stripping on the face of the panels further reduce any potential glare issues that may occur.

The level of glare and reflectance from the PV solar panels are considerably lower than the level of glare and reflectance of common surfaces, particularly those surrounding the proposed solar plant. The PV panels would reflect approximately 6.5% of energy which is less than typical rural environments which have a reflectivity of approximately 15-30%. It is also worth noting that because they will be single access tracking, the incident angle would be lower than the example given in **Image 8**. **Figure 7 & 8** compare the percentage of reflected energy from common reflective surfaces to that of a PV Solar Panel.



Image 8. Example of Solar Panels installed at Manildra Solar Farm (2018)

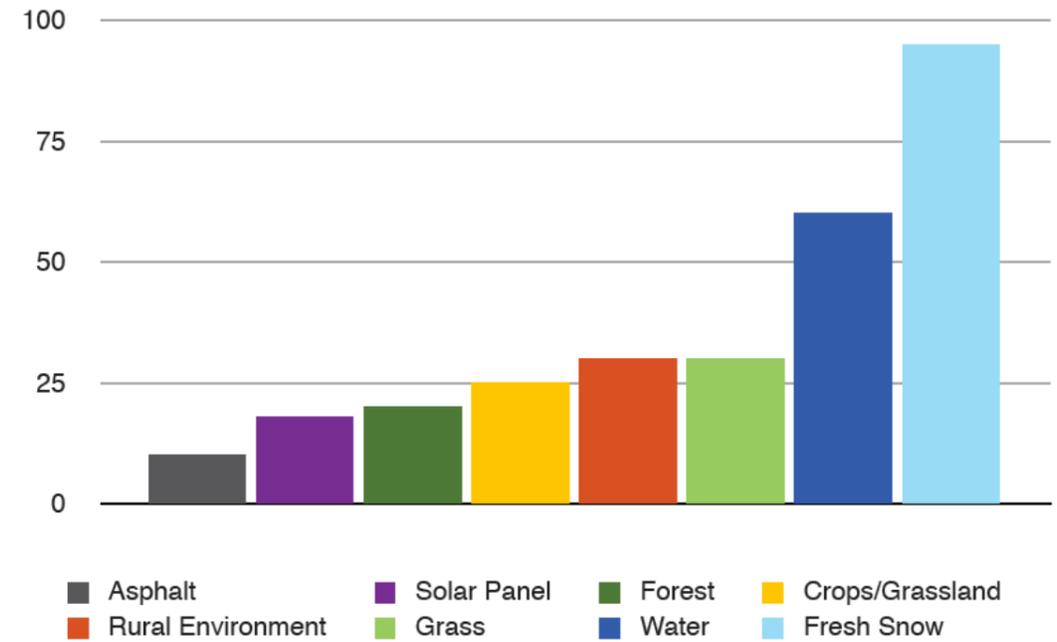


Figure 7. Comparative Reflectivity Analysis

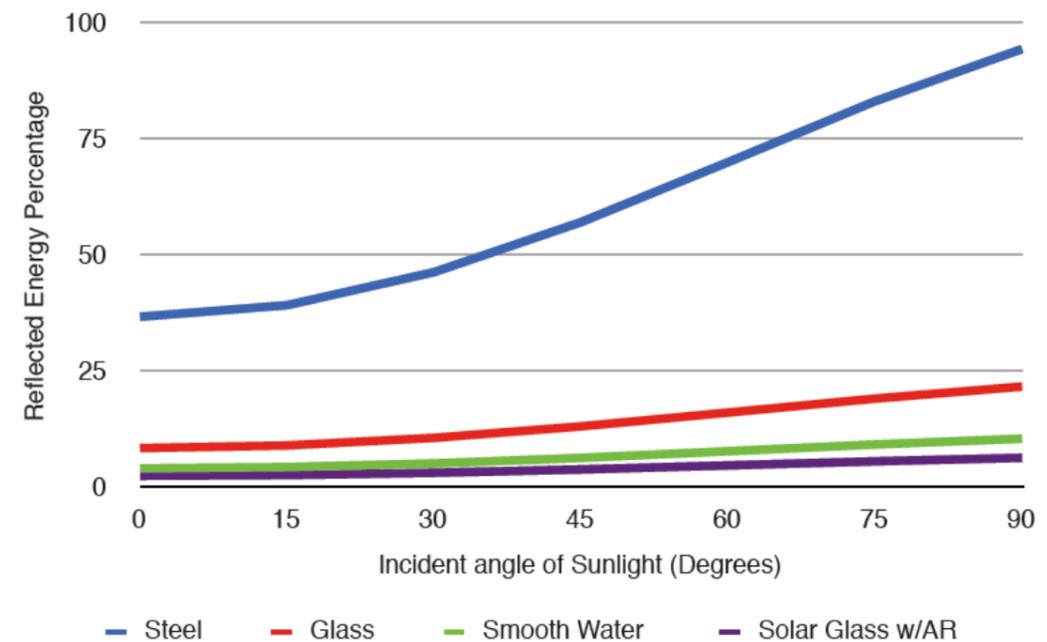


Figure 8. Analysis of Typical Material Reflectivity

9.0 Nightlighting, Reflectivity and Glare

9.3 Overview of Reflectivity and Glare Impact to Air Traffic

There are no commercial airports within close proximity to the study area. Gulgong Aero Park is located approximately 3.6 kilometres south of the Site and is utilised for recreational sports aviation.

The Civil Aviation Safety Authority (CASA) generally applies the guidance information prepared by the Federal Aviation Authority (FAA) when assessing the suitability of solar installation near an airport.

A discussion paper on Planning for Renewable Energy Generation prepared by the NSW Planning in 2010 states: The potential for glare associated with non-concentrating PV systems which do not involve mirrors or lenses is relatively limited. The reason is that PV panels are designed to absorb as much solar energy as possible in order to generate the maximum amount of electricity or heat. As such, PV panels will not generally create noticeable glare compared with an existing roof or building surface.

Impact of solar PV on aviation and airports undertaken by the Solar Trade Association concludes they do not believe that there is cause for concern in relation to the impact of glint and glare from solar PV on aviation and airports, nor relating to infringement on airspace or interference with communications equipment. Solar PV panels are designed to absorb not reflect light, and their level of reflectivity is lower than that of other objects commonly visible on and around aerodromes, e.g. metal roofs, glass windows, cars, and bodies of water.

9.4 Overview of Reflectivity and Glare Impact to Dwellings

Table 5 and **Table 6** (Section 8.0) provide an overview of potential glare for each dwelling identified surrounding the Project Site. The low visibility of the Project Site prevents views from most dwellings. Accordingly, the potential for residences to experience glare associated with the proposal is negligible.

10.0 Mitigation Recommendations

10.1 Recommended Mitigation Methods

The SEARs state the LVIA is to include ‘a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners;’

As discussed in **Section 8.0**, the opportunities to view the Project are very limited and as a result there are no areas likely to experience unacceptable visual impacts and no direct impacts on landowners. The following outlines recommendations to further reduce any potential visibility of the Project.

These recommendations seek to achieve a better visual integration of the proposed development within the existing landscape character of the area. The measures suggested in this section are intended to lessen the visual impact of the development whilst ensuring the existing visual character of the area is not altered significantly. This is by no means an exhaustive list however the adoption of these recommendations will assist considerably in ensuring that potential impacts are reduced.

10.1.1 Design Considerations

Good design principles employed through the project design phase can significantly reduce the visual impact. These include the siting principles, access, layout and other aspects of the design which directly influence the appearance of the proposed development. The following outlines the design considerations that have been applied to the site:

- The design will retain the existing roadside planting where possible along the eastern boundary of the site to reduce the overall visual impact.
- Consideration will be given to the colours of the PCUs, the battery facility, O&M buildings and storage shed to ensure minimal contrast and to help blend into the surrounding landscape to the extent practicable (see Image 9).
- Existing vegetation within the environmental exclusion zones will be retained and protected to maintain the existing level of screening.
- Consideration should be given to controlling the type and height of PCU's, the battery, and storage shed to ensure the development does not contrast significantly with surrounding landscape.

10.1.2 Vegetation Retention

Sparse, scattered vegetation and undulating agricultural land characterise the area. Therefore, the Site has limited existing vegetation to retain. However, existing vegetation within the environmental exclusion zone should be retained and protected, during the works to maintain the existing level of screening.



Image 9. Example of a building colour palette sympathetic to the surroundings

11.0 Conclusion

11.1 Conclusion

With all visual impact assessments the objective is not to determine whether the proposal is visible or not, it is to determine how the proposal will impact on existing visual amenity, landscape character and scenic quality. If there is a potential for a negative impact on these factors it must then be investigated and determined how this impact can be mitigated to the extent that the impact is reduced to an acceptable level.

Due to the existing land use of grazing and modified pasture, land has been extensively cleared. The Proposal is likely to require the removal of a small amount of scattered vegetation which in the context of the broader landscape would have a negligible visual impact.

Due to the relatively low height of the panels, the existing topography and the broad scale of the view, the recommended mitigation methods required to reduce the potential visual impacts are limited and will be effective in integrating the development into the surrounding landscape. With the implementation of the recommended mitigation measures, the proposed development could be undertaken whilst maintaining the core landscape character of the area, and have a minimal visual impact on the surrounding visual landscape.

The Site will be altered as a result of the Proposal, however once decommissioned, the visual landscape has the capacity to return to its current state. The proposed development could be undertaken whilst maintaining the core landscape character of the area, and have a minimal visual impact on the surrounding visual landscape.

References

PUBLICATIONS AND REPORTS

Colleran, JR. & Gearing D. (1980) *A Visual Assessment Method for Botany Bay*, Landscape Australia, 3 August.

DOP (1988) *Rural Land Evaluation*, Government Printer, Department of Planning.

EDAW (Australia) Pty Ltd (2000) 'Section 12 – Visual Assessment', *The Mount Arthur North Coal Project: Environmental Impact Statement*, URS Australia Pty Ltd, Prepared for Coal Operations Limited.

Federal Aviation Administration, Technical Guidance for Evaluating Selected Solar Technologies on Airports, April 2018, Washington, DC

Horner + Maclennan & Envision (2006) Visual Representation of Windfarms - Good Practice Guidelines. Scottish Natural Heritage, Inverness, Scotland.

New South Wales Department of Planning, (2010) <http://www.planning.nsw.gov.au/>

New South Wales Government, Large-Scale Solar Energy Guideline For State Significant Development, December 2018

Solar Trade Association, Impact of Solar PV on aviation and airports undertaken by the Solar Trade Association, 2015

The Landscape Institute with the Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Assessment Third Edition, Newport, Lincoln.

Urbis (2009) Berrybank Visual Impact Assessment - Final Report, Australia.

MAPS

Google Earth Pro 2020 Viewed September 2020 - November 2020 www.google.com/earth/index.html

NSW Government Land and Property Information, Spatial Information Exchange SIX Maps, Accessed at: <http://maps.six.nsw.gov.au/> [Accessed between September 2020 – November 2020]